

ERIOGONUM (POLYGONACEAE)
OF
ARIZONA AND NEW MEXICO

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With the increased interest in endangered and threatened plants in the United States, the need for modern keys and descriptions of critical genera is becoming more apparent. There is a growing concern among government officials, both federal and state, that their field workers, even when trained in botany, will not have adequate floras to review and ascertain the biology of the plants considered as endangered or threatened, and to determine the relationships between those plants which are common and those which are rare. The need now for a national flora of the United States is greater than at any time in the history of the nation, but the prospect of a set of manuals which will be of use to the forester, the range manager, and the farmer seems more remote than ever.

The present review of the genus *Eriogonum* (Polygonaceae) is done at the request of the United States Forest Service and the Bureau of Land Management. These two federal agencies are taking an active role in the management of their lands to insure the continued existence of the several species of vascular plants now thought to be endangered or threatened. Although there are a number of species of *Eriogonum* which fall into these categories, the genus is only one of many such genera which investigators should prepare modern treatments for in order to aid these federal agencies in their work. With no treatment of the flora of the southwestern United States available at present which gives both keys and descriptions, such random treatments will be all field workers can hope for.

ERIOGONUM Michx. Wild Buckwheat

Annual or perennial herbs and shrubs with basal or cauline, alternate leaves and often with alternate or whorled scalelike to foliaceous bracts, entire and estipitate; flowers perfect or im-

perfect, borne in campanulate to turbinate or cylindric involucre, 4--10-lobed or toothed, awnless, few- to many-flowered, sessile or peduncled; tepals petaloid, 6-parted in two series of 3 segments each, on a distinct pedicel or the base of the flower attenuated into a stipelike base; stamens 9, the filaments filiform, often pilose basally; ovary 1-celled, styles 3 with capitate stigmas; achenes mostly 3-angled or winged. A North American genus of some 250 species found mainly in the western United States. (Greek, *erion*, wool, and *gonu*, knee or joint, the type of the genus, *E. tomentosum* Michx., being hairy at the nodes.)

KEY TO ERIOGONUM IN ARIZONA

- A. Flowers with stipelike bases, mostly yellow to reddish-yellow, glabrous or pubescent; low spreading cespitose to subshrubby perennials.
 - B. Flowers glabrous; widespread and common across the northern tier of counties 28. *E. umbellatum*
 - BB. Flowers pubescent without.
 - C. Involucre with long, reflexed lobes; flowering stems scapose and ebracted, with a large single terminal involucre; extreme northern Mohave Co. 29. *E. caespitosum*
 - CC. Involucre with shallow erect teeth; flowering stems bracted, terminated by an open, often branched inflorescence, or if capitate, then plants of the Kaibab Plateau; widespread 30. *E. jamesii*
- AA. Flowers not attenuated into a stipelike base.
 - B. Plants perennials (see also *E. inflatum*).
 - C. Plants cespitose to large shrubs; stems and branches glabrous to tomentose, not strigose; achenes not winged or plump, usually enclosed by the mature flower, brown to black.
 - D. Plants distinct shrubs or subshrubs, woody above the spreading caudex and not dying back completely to the ground after each year.
 - E. Flowers pubescent without, 2.5--3.5 mm long, white to pink; low shrubs; common throughout most of the state . . . 12. *E. fasciculatum*
 - EE. Flowers glabrous without.
 - F. Stems smooth, glabrous to tomentose, not angled or ribbed, nor scabrellous.
 - G. Inflorescences small and compact, cymose, with involucre dichotomously arranged even at the tips of the branches; stems usually tomentose, occasionally floccose or glabrous.
 - H. Leaves revolute, narrow.
 - I. Leaves 2--6 cm long.
 - J. Inflorescences open and spreading, 1.5--6 cm

- long, white-tomentose or lanate to (rarely) glabrate and green; leaves 0.3—4 cm long, mostly rigid; rather common in the northern half of the state 1. *E. microthecum*
- JJ. Inflorescences densely cymose, 2—15 cm long, glabrous and bright green; leaves 1.5—6 cm long, mostly flaccid; infrequent and local in Apache and Navajo cos.
- . . . 4. *E. leptophyllum*
- II. Leaves 0.5—2 cm long.
- J. Plants subshrubs to low shrubs, not matted; leaves 2—4 mm wide; involucre 2—2.5 mm long
- . . . 1. *E. microthecum*
- JJ. Plants matted, less than 1 dm high.
- K. Flowers 3.5—4.5 mm long; involucre atop of bractless stems; leaves 2—6 mm long, 0.5—1 mm wide; local and rare, southwestern Coconino Co. and northern Yavapai Co.
- . . . 2. *E. ripleyi*
- KK. Flowers 2—2.5 mm long; involucre subtended by bracts; leaves 5—8 mm long, 0.8—2 mm wide; western Mohave Co. east to Navajo Co. and south to Yavapai Co.
- . . . 3. *E. ericifolium*
- HH. Leaves flat, not revolute.
- I. Leaves sharply acute, the blades mostly narrowly elliptic, 1—8 mm wide; plants mostly low subshrubs with floccose stems and of Mohave and Coconino cos., or erect shrubs with glabrate and green stems of Navajo and Apache cos. . . . 1. *E. microthecum*

- II. Leaves acute to obtuse or rounded apically, more than 8 mm wide, or if 2--5 mm wide, then margin crenulate and branches of the inflorescence zig-zag.
- J. Inflorescences cymose and + open, not zig-zag.
- K. Leaf-blades oblanceolate to elliptic or nearly orbicular, 1--5 cm long, the base cuneate, not cordate or truncate; stems and branches mostly white to grayish tomentose, or infrequently glutinose and green; common from eastern Mohave Co. to Apache Co. . . 6. *E. corymbosum*
- KK. Leaf-blades cordate, 1.5--2.5 cm long, the base cordate to truncate; stems and branches brownish-white; local and rather common from east-central Mohave Co. to extreme western Navajo Co. . . . 8. *E. jonesii*
- JJ. Inflorescences of compact masses of zig-zag branches; leaves oblong-lanceolate to oblanceolate, 6--15 mm long, 2--5 mm wide, crenulate; western Mohave Co. . . 15. *E. plumatella*
- GG. Inflorescences large with numerous branches and branchlets bearing racemosely arranged involucre along their tips; stems and branches glabrous to floccose or infrequently tomentose.
- H. Inflorescences open, branches not zig-zag.
- I. Leaves 1--4.5 cm long, 2--15 mm wide; inflorescences with involucre racemosely arranged only at the tips of the branches; plants large shrubs 3--13 dm high, up to 20 dm

- across; sandy places in northern Arizona.
- J. Leaves tomentose at least below.
- K. Leaves linear-lanceolate to oblanceolate or narrowly elliptic, 1.5—4.5 cm long, 2—8 mm wide; branches floccose to glabrous; Coconino Co. eastward . . . 9. *E. leptocladon*
- KK. Leaves oblanceolate to elliptic, 1—2.5 (3) cm long, 5—15 mm wide; branches tomentose; Coconino Co. westward . . . 10. *E. hearneyi*
- JJ. Leaves glabrous on both surfaces; plants glabrous throughout; rare and local in extreme eastern Mohave Co. west of Fredonia . . . 11. *E. mortonianum*
- II. Leaves 0.5—1.5 cm long, 2—5 (7) mm wide; inflorescences with long branches essentially with racemosely arranged involucre throughout; plants low subshrubs 1.5—4 dm high, 1—5 dm across, or if up to 7 dm high and 10 dm across, then plants of southern Arizona; common and widespread throughout the state . . . 22. *E. wrightii*
- HH. Inflorescences long with compactly arranged zig-zag clusters of branches, tomentose or glabrous; leaves oblong-lanceolate to oblanceolate, 6—15 mm long, 2—5 mm wide, crenulate; western Mohave Co. . . . 15. *E. plumatella*
- FF. Stems angled and ribbed or scabrellous, not smooth.
- G. Involucre campanulate, (0.7) 1—1.5 mm long, 1—2 mm wide; flowers 1.5—2 mm long; low subshrubs up to 6 dm high; stems and branches ribbed and angled or scabrellous; plants of north-western Arizona . . . 13. *E. heermannii*

- GG. Involucres turbinate, 0.8--1.5 mm long, 0.7--1.3 mm wide; flowers (2.5) 3--4 mm long; erect, usually much-branched shrubs to 5 dm high; stems and branches scabrellous; southeastern Arizona . . . 14. *E. apache*
- DD. Plants herbaceous, caespitose or pulvinate perennials.
- E. Plants herbaceous; inflorescences open.
- F. Involucres not arranged racemously along elongated branches.
- G. Flowers glabrous without.
- H. Leaves linear to oblong or elliptic, 0.6--5 cm long, 2--15 mm wide, densely tomentose below; involucres sessile, not pedunculate; flowers smooth, not broadly expanded basally; Mohave and Coconino cos.
- I. Flowers 2--2.5 mm long; inflorescences with zig-zag branches, tomentose or if glabrous then grayish; involucres 2--2.5 mm long; leaves oblanceolate to oblong-lanceolate, 6--15 mm long, 2--4 mm wide; infrequent, western Mohave Co. . . . 15. *E. plumatella*
- II. Flowers 3--3.5 mm long; inflorescences open, cymose, glabrous and green; involucres 2--3.5 mm long; leaves linear to oblanceolate or oblong to elliptic, (2) 3--5 cm long, (3) 4--15 mm wide; local and rare, northeastern Mohave Co. and to be expected in northwestern Coconino Co. 16. *E. thompsonae*
- HH. Leaves ovate to rounded, 0.5--2 cm long and wide, densely white-pilose on both surfaces; involucres 1.5--2 mm long, on peduncles 0.5--2.5 cm long; flowers with broadly expanded bases; local and rare in widely scattered locations in the northwestern and eastern part of Arizona 33. *E. arizonicum*
- GG. Flowers pubescent without.
- H. Flowers densely pubescent without

- with long white hairs, 2.5—5 (6) mm long; involucre campanulate, 3—6 mm wide; inflorescences subcapitate or rarely cymose; rare and local in central Apache Co. 20. *E. lachnogynum*
- HH. Flowers sparsely to densely pubescent with thin, strigose hairs, usually yellowish or reddish but never white; inflorescences open and much divided.
- I. Stems and branches strigose, slender; achenes plump, winged at the apex; local, White Mts., Apache Co. 31. *E. hieracifolium*
- II. Stems and branches glabrous or merely sparsely hirsute near the base, often inflated; achenes slender, the apex merely 3-angled; common and widespread throughout most of the state . . . 34. *E. inflatum*
- FF. Involucres racemously arranged along elongated branches.
- G. Plants suffrutescent, low and spreading with numerous branches and stems from the base; involucre 1—2.5 mm long; flowers white, 1.5—3.5 mm long; leaves small, 0.5—1.5 cm long, 2—5 (7) mm wide; widespread and common in Arizona 22. *E. wrightii*
- GG. Plants strictly herbaceous, upright and erect with one to few erect branches from the base; involucre 1.5—5 mm long; flowers white to scarlet-red, 2—5 mm long; leaves large, 1.5—10 cm long, 1—3.5 cm wide; local and restricted to the mountains of northern Arizona.
- H. Stems and branches tomentose to floccose; common 23. *E. racemosum*
- HH. Stems and branches glabrous; rare and local; both rims of the Grand Canyon 24. *E. zionis*
- EE. Plants cespitose or pulvinate; inflorescences capitate.
- F. Flowers pilose without; achenes and ovaries pubescent; scapose branches up to 3 cm long; eastern Mohave Co. eastward . .

- 25. *E. shockleyi*
 FF. Flowers glabrous; achenes and ovaries
 glabrous; scapose branches up to 15 cm
 long; northern Arizona
 26. *E. ovalifolium*
 CC. Plants erect perennial herbs with elongated, strigose
 stems and branches; achenes winged and plump, exceed-
 ing the flowers at least half their length, greenish
 to yellowish or light brown.
 D. Flowers yellow, strigose without; achenes plump
 and winged only at the apex; plants not monocarp-
 ic; White Mts., Apache and Navajo cos.
 31. *E. hieracifolium*
 DD. Flowers yellowish-green, glabrous without; achenes
 plump and winged the entire length of the fruit;
 plants monocarpic; widespread in northern and
 eastern Arizona 32. *E. alatum*
 BB. Plants annual, or if perennial, the flowers yellow and
 hirsute on long, slender peduncles, and the stems and
 branches often inflated.
 C. Involucres smooth, not ribbed or angled, usually dis-
 tinctly peduncled, or if sessile, then not vertically
 appressed to the stems; annuals or perennials.
 D. Leaves glabrous, pilose, hispid, or villous on
 one or both surfaces.
 E. Flowers pubescent without with pilose to hir-
 sute hairs, yellow or rarely white to pink.
 F. Flowers hirsute without with long, appres-
 sed white hairs, bright yellow; stems and
 branches glabrous or sparsely hirsute at
 the base and infrequently at the lower
 nodes.
 G. Involucres 5-toothed; plants annual or
 perennial with open inflorescences,
 the lower nodes with 3--5 branchlets;
 flowers 1--3 mm long; stems often in-
 flated; common and widespread through-
 out most of the state
 34. *E. inflatum*
 GG. Involucres 4-toothed; plants strictly
 annual with whorls of branches (often
 5--20) radiating from the lower nodes;
 flowers mostly 1--2 mm long; stems
 usually not inflated; widespread and
 common in all but the northeastern
 part of the state . 35. *E. trichopes*
 FF. Flowers sparsely pubescent without with
 scattered minute hairs, white to pink or
 pale yellow; stems and branches glandular
 at the nodes or villous at the base and
 lower nodes.

- G. Plants glabrous but sparsely glandular at the upper nodes, rounded and compact with hemispherical crowns; leaves spatulate, hirsute; involucre 0.5—0.9 mm long; flowers red to pink, 0.5—0.9 mm long; rare and local, Yavapai Co. 37. *E. parishii*
- GG. Plants glabrous but sparsely floccose at the lower nodes, open and spreading; leaves oblong-ob lanceolate to obovate, floccose; involucre 1—1.8 mm long; flowers pale yellow, 1—2.5 mm long; rare and perhaps extirpated from the state, to be expected in sandy soil near old Fort Mohave, Mohave Co. 38. *E. ordii*
- EE. Flowers glabrous without.
 - F. Flowers 1—2.5 mm long, the tepals mostly oblong, not pandurate; achenes 2—2.5 mm long; involucre 0.6—1.3 mm long; rare, Apache Co. 40. *E. gordonii*
 - FF. Flowers 0.8—1.6 mm long, the tepals pandurate with the lower lobes auriculate and + swollen; achenes 1.3—1.6 mm long; involucre 1—1.5 mm long; Gila and Graham cos. 41. *E. capillare*
- DD. Leaves tomentose to lanate below, infrequently white-pilose.
 - E. Leaves strictly basal or sheathing up the lower stems, not at the lower nodes.
 - F. Involucre 1—3 mm long, or if shorter, then flowers with saccate-dilated bases on the outer tepals.
 - G. Flowers glabrous without.
 - H. Leaves white-pilose on both surfaces, ovate to rounded, 0.5—2 cm long and wide; flowers with broadly expanded bases; plants perennial; local and rare in widely scattered locations in the northwestern and eastern part of the state . . 33. *E. arizonicum*
 - HH. Leaves tomentose or lanate; plants strictly annual.
 - I. Outer tepals cordate at the base, mostly oblong to orbicular.
 - J. Involucre deflexed.
 - K. Plants glabrous.
 - L. Involucre turbinate; flowers

- white to pink;
northern Arizona
42. *E. deflexum*
- LL. Involucres campanulate; flowers
yellow to reddish-yellow; north-central Arizona . . .
. 43. *E. hookeri*
- KK. Plants glandular; extreme northern Mohave Co.
. 44. *E. brachypodium*
- JJ. Involucres erect or horizontal on the branches, not strictly deflexed.
- K. Stems and branches
glabrous; extreme northern Mohave Co.
. 45. *E. insigne*
- KK. Stems and branches
scabrellous; to be expected in north-eastern Arizona . . .
. 46. *E. scabrellum*
- II. Outer tepals truncate to obtuse at the base.
- J. Outer tepals pandurate, crisped along the margin; peduncles cernous to ascending; involucres 1--1.5 mm wide; northern Arizona
. 47. *E. cernuum*
- JJ. Outer tepals flabellate, not crisped along the margin; peduncles stiffly erect; involucres 1.5--2.5 mm wide; southeastern Arizona
. 48. *E. rotundifolium*
- GG. Flowers glandular or sparsely pubescent without.
- H. Flowers white to pink or red, glandular at the base without, with a tuft of white hairs within, the outer tepals flabellate; western and southern Arizona
. 49. *E. thurberi*
- HH. Flowers yellow, or if whitish, then with saccate-dilated bases, glandular throughout.

- I. Outer tepals saccate-dilated at the base; involucre 0.6–1.2 mm long, glabrous; western and southern Arizona 50. *E. thomasi*
- II. Outer tepals smooth; involucre 1–2 mm long, glabrous or glandular without.
 - J. Flowers and involucre glandular-puberulent; bracts glandular without; western Arizona 51. *E. pusillum*
 - JJ. Flowers glandular-puberulent without; involucre glabrous without; bracts villous without; rare and often local, western Arizona . 52. *E. reniforme*
- FF. Involucre 0.3–1 mm long.
 - G. Flowers yellow to red, 0.5–1.5 mm long; involucre 4-toothed; inflorescences densely branched and spreading; northeastern Arizona from Coconino Co. eastward 53. *E. wetherillii*
 - GG. Flowers white to pink or rose, 0.8–2 mm long; involucre 5-toothed; inflorescences open and erect; clay hills in northeastern Mohave Co., northern Coconino Co., and southern Apache Co. 54. *E. subreniforme*
- EE. Leaves basal and cauline.
 - F. Flowers glabrous without.
 - G. Leaves oblong to ovate, villous to hoary on both surfaces; tepals strongly dimorphic, the outer tepals orbicular and smooth at maturity; common and widespread mainly in the southern half of the state . . . 55. *E. abertianum*
 - GG. Leaves linear-lanceolate to linear-ob lanceolate, lanate below, villous above; tepals dimorphic, the outer tepals oblong-ovate with a large saccate part on each side of the base; common and widespread from northwestern Arizona to southeastern Arizona 56. *E. pharnaceoides*
 - FF. Flowers glandular-pubescent without with non-capitate hairs; tepals dimorphic, the outer tepals inflated and with a large purple spot; common in western and south-

- ern Arizona 57. *E. maculatum*
- CC. Involucres angled to strongly ribbed, tightly appressed to the stems and always sessile; plants strictly annual.
- D. Leaves tomentose at least below; stems and branches glabrous to tomentose.
- E. Stems and branches glabrous; inflorescences open and strict, 0.5—3 dm long; involucres 3—5 mm long; flowers white, 1.5—2 mm long; local and rare in western and northern Arizona 58. *E. davidsonii*
- EE. Stems and branches tomentose to floccose.
- F. Leaves basal.
- G. Flowers yellow to red; plants densely branched with the upper tips often curving inwardly, the crowns dense and much branched; Mohave Co. 59. *E. nidularium*
- GG. Flowers white; plants open with spreading branches, the crowns open and few branched; widespread throughout all but the northeastern Arizona 60. *E. palmerianum*
- FF. Leaves cauline; plants strict and erect, 1—6 dm tall; flowers white; widespread throughout the state, becoming rare in the northern part 62. *E. polycladon*
- DD. Leaves, stems, and branches puberulent to villous.
- E. Outer tepals oblong to ovate, not fan-shaped or hooded.
- F. Stem leaves foliaceous at the lower nodes, puberulent or short pilose; involucres 5-toothed; flowers yellowish, hispidulous and often glandular, 1.5—2 mm long; common across the northern part of the state 63. *E. divaricatum*
- FF. Stem leaves bractlike, silky-pubescent; involucres 4-toothed; flowers white to red, glabrous or hispidulous, 1—1.5 mm long; to be expected in extreme northern Mohave Co. 64. *E. puberulum*
- EE. Outer tepals fan-shaped and hooded; plants leafy throughout and sericeous; extremely rare and local, northwestern Coconino Co. 65. *E. darrovii*

KEY TO ERIOGONUM IN NEW MEXICO

- A. Plants perennial.
 - B. Flowers stipitate basally; low spreading caespitose to herbaceous plants with spreading woody caudices.
 - C. Flowers glabrous without; northwestern New Mexico 28. *E. umbellatum*
 - CC. Flowers pubescent without; common and widespread in the state 30. *E. jamesii*
 - BB. Flowers not attenuated into a stipelike base.
 - C. Plants caespitose to large shrubs; stems glabrous to tomentose, not strigose; achenes not winged or plump, usually enclosed by the mature flower, brown to black.
 - D. Plants distinct shrubs or subshrubs, woody above the caudex and not dying back completely to the ground after each year.
 - E. Leaves tightly revolute.
 - F. Inflorescences open, 0.5--5 cm long, white-tomentose to lanate, or glabrate and green; leaves 0.5--5 cm long; northwestern New Mexico 1. *E. microthecum*
 - FF. Inflorescences dense, 3--15 cm long, glabrous and green; leaves 1.5--6 cm long; northwestern New Mexico 4. *E. leptophyllum*
 - EE. Leaves flat, not tightly revolute.
 - F. Leaves 1.5--5 cm long; plants of the northern half of the state.
 - G. Inflorescences 0.2--1 dm long; leaves mostly 1--3 cm wide.
 - H. Stems and branches tomentose to floccose; leaves elliptical-oblong to oval, 1.5--2.5 cm long; flowers cream, 2--2.5 mm long; central and northwestern New Mexico 6. *E. corymbosum*
 - HH. Stems and branches glabrous or rarely floccose basally; leaves lanceolate to elliptic, 1.5--5 cm long; flowers white, 2.5--4 mm long; northeastern New Mexico 7. *E. fendlerianum*
 - GG. Inflorescences 1--4 dm long; leaves mostly 0.2--1 cm wide.
 - H. Tomentum floccose and blackish upon drying; inflorescences 1--4 dm long, the involucre dichotomously arranged throughout; leaves oblong to oblanceolate, (1) 1.5--3 cm long, (2) 3--7 mm wide; northern half of the state . . .

- 5. *E. effusum*
 HH. Tomentum floccose and whitish, or lacking and the stems and branches glabrous, 1--3 cm long, the involucre racemosely arranged at the tips of the branches; leaves linear-lanceolate to linear-oblongate, 1.5--4.5 cm long, 2--5 mm wide; San Juan Co.
 9. *E. leptoclados*
 FF. Leaves 0.5--1.5 cm long, 2--5 (7) mm wide, oblanceolate to elliptic; inflorescences with involucre racemosely arranged along elongated branches; involucre 2.5--3.5 mm long; flowers 2.5--3.5 mm long; common mainly in the southern half of the state
 22. *E. wrightii*
 DD. Plants herbaceous, caespitose or pulvinate perennials.
 E. Plants herbaceous; inflorescences open.
 F. Involucre not arranged racemosely along elongated branches.
 G. Leaves glabrous on both surfaces with a few hairs along the margin and midvein; flowers yellow, finely white-pubescent without along the midrib and base, 1--2 mm long; rare and local in Eddy Co. 17. *E. gypsophilum*
 GG. Leaves tomentose on at least one surface; flowers white, or if yellow, then densely pubescent without with long hairs.
 H. Flowers glabrous without.
 I. Inflorescences umbellate and short, less than 1 cm long; flowering stems erect, 1--2.5 cm long, tomentose to floccose; reportedly collected in northern New Mexico
 18. *E. brandegei*
 II. Inflorescences open and divided; flowering stems glabrous.
 J. Tepals monomorphic; leaves narrow, mostly linear to lanceolate or oblanceolate, 2--15 cm long; north central and northwestern New Mexico
 19. *E. lonchophyllum*
 JJ. Tepals dimorphic; leaves elliptic, 0.2--1.5 cm

- long; northeastern New Mexico , 36. *E. tenellum*
- HH. Flowers densely pubescent without.
- I. Stem tomentose; inflorescences subcapitate to short cymose or umbellate, up to 6 cm long; involucre 3--4 mm long; flowers 2.5--4.5 mm long; achenes woolly, 3--4 mm long; gravelly to clay outcrops in northern New Mexico
- 20. *E. lachnogynum*
- II. Stems glabrous; inflorescences cymose, 1--4 dm long; involucre 1.5--2.5 mm long; flowers 2--3 mm long; achenes glabrous, 2--2.5 mm long; gravelly to rocky places in southeastern New Mexico . 21. *E. havardii*
- FF. Involucres racemosely arranged along elongated branches.
- G. Plants suffrutescent; leaves small, 0.5--1.5 cm long; widespread and common throughout most of the southern half of the state . 22. *E. wrightii*
- GG. Plants erect herbs; leaves large, 1.5--10 cm long, 1--3.5 cm wide; rather common in the coniferous forests of northwestern New Mexico
- 23. *E. racemosum*
- EE. Plants caespitose and pulvinate; inflorescences capitate.
- F. Tepals monomorphic.
- G. Flowers glabrous; scapose branches 1--2.5 dm long; involucre 3.5--5 mm long; leaves 1.5--4 cm long, 4--8 mm wide; reportedly from northern New Mexico 18. *E. brandegei*
- GG. Flowers pilose without; scapose branches up to 0.3 dm long; involucre (3) 4--6 mm long; leaves 0.3--1.2 cm long, (3) 4--6 mm wide; San Juan Co. 25. *E. shockleyi*
- FF. Tepals strongly dimorphic, glabrous; scapose stems 0.4--2 dm long; involucre 4--6.5 mm long; leaves 0.5--6 cm long, 0.5--1.5 cm wide; widespread and rather common in northwestern New Mexico
- 26. *E. ovalifolium*
- CC. Plants erect perennial herbs with strigose stems and branches, not glabrous or tomentose; achenes large,

plump and winged, yellowish to yellowish-brown.

D. Flowers yellow, pubescent without; achenes winged at the apex; widespread and common from southeastern New Mexico to west-central New Mexico 31. *E. hieracifolium*

DD. Flowers greenish to greenish-yellow, glabrous without; achenes winged the entire length; widespread and common throughout most of the state 32. *E. alatum*

AA. Plants annual or biennial, or if perennial, then stems and branches inflated and flowers hirsute without.

B. Plants perennial or biennial.

C. Plants biennial; stems strict and erect, leafy and not inflated; flowers glabrous without, tomentose within; widespread and common in eastern New Mexico 27. *E. annuum*

CC. Plants first-year flowering perennials; stems spreading, leafless and often inflated; flowers hirsute without, glabrous within; infrequent in northwestern New Mexico 34. *E. inflatum*

BB. Plants annual.

C. Involucres smooth, not ribbed or angled, usually distinctly peduncled, or if nearly sessile, then not vertically appressed to the stems.

D. Leaves glabrous, pilose, hispid or villous on one or both surfaces, not tomentose.

E. Flowers pubescent without with pilose to hirsute hairs, yellow.

F. Involucres 5-toothed; plants annual or perennial with open inflorescences, the lower nodes with 3—5 branchlets; flowers 1—3 mm long; stems often inflated; infrequent in northwestern New Mexico 34. *E. inflatum*

FF. Involucres 4-toothed; plants strictly annual with whorls of branchlets (often 5—20) radiating from the lower nodes; flowers mostly 1—2 mm long; stems usually not inflated; widespread and locally common in the southern part of the state 35. *E. trichopes*

EE. Flowers glabrous without, yellow or white.

F. Flowers yellow, 1.2—2 mm long; involucres sessile above, peduncled at the lower nodes; leaves basal and cauline, elliptic; rare and local, near Cimmaron, Colfax Co. 39. *E. aliquantum*

FF. Flowers white, 1—2.5 mm long; involucres peduncled throughout; leaves strictly basal, obovate to round or reniform; infrequent in northwestern New Mexico . . .

- 40. *E. gordonii*
 DD. Leaves tomentose to lanate below.
 E. Leaves strictly basal or sheathing up the lower stems, not at the lower nodes.
 F. Involucres 1—3 mm long.
 G. Flowers yellow; involucres deflexed, sessile, broadly campanulate; to be expected in extreme northwestern San Juan Co. 43. *E. hookeri*
 GG. Flowers white; involucres peduncled, turbinate, or if sessile, then stems scabrellous.
 H. Stems and branches scabrellous; flowers white but turning reddish, 1--1.5 mm long, pustulose; involucres sessile and horizontal along the branches; to be expected in extreme northwestern San Juan Co. 46. *E. scabrellum*
 HH. Stems and branches smooth; flowers smooth; involucres peduncled.
 I. Outer tepals pandurate, crisped along the margin; peduncles cernous to ascending; involucres 1--1.5 mm wide; widespread and rather common in northwestern and north-central New Mexico 47. *E. cernuum*
 II. Outer tepals flabellate, not crisped along the margin; peduncles stiffly erect; involucres 1.5--2.5 mm wide; widespread and common in the southern half of the state 48. *E. rotundifolium*
 FF. Involucres 0.3--1 mm long.
 G. Flowers yellow to red, 0.5--1.5 mm long; involucres 4-toothed; inflorescences densely branched and spreading; northwestern San Juan Co. 53. *E. wetherillii*
 GG. Flowers white to pink or rose, 0.8--2 mm long; involucres 5-toothed; inflorescences open and erect; clay hills in McKinley Co. . . 54. *E. subreniforme*
 EE. Leaves basal and cauline.
 F. Leaves oblong to ovate, villous to hoary on both surfaces; tepals strongly dimorphic, the outer tepals orbicular and smooth at maturity; common and widespread throughout the state . 55. *E. abertianum*

- FF. Leaves linear-lanceolate to linear-oblan-
ceolate, lanate below, villous above; te-
pals dimorphic, the outer tepals oblong-
ovate with a large saccate base on each
side at the base; common and widespread
in the mountains of western New Mexico .
. 56. *E. pharnaceoides*
- CC. Involucres angled to strongly ribbed, tightly appress-
ed to the stems and always sessile; plants strictly
annuals.
- D. Stems densely tomentose; leaves basal, or if cau-
line, then densely tomentose on both surfaces;
flowers glabrous.
- E. Leaves basal.
- F. Plants open and spreading with only a few
scattered involucres along the branches,
1--3 dm high; involucres campanulate, 1.5-
--2 mm long; rather common but local in the
mountains of southwestern New Mexico . . .
. 60. *E. palmerianum*
- FF. Plants dense and compact with numerous
congested involucres tightly arranged on
the branches, 0.5--1.5 dm high; involucres
turbinate, 1--1.5 mm long; rare and per-
haps extinct, Grant Co. . 61. *E. densum*
- EE. Leaves cauline; plants strict and erect, 1--6
dm tall; flowers white; widespread throughout
the southern part of the state
. 62. *E. polycladon*
- DD. Leaves, stems and branches puberulent or short
pilose and green; leaves basal and cauline; flow-
ers hispidulous and often glandular; infrequent
in northwestern New Mexico . 63. *E. divaricatum*

SUBGENUS EUCYCLA (NUTT.) KUNTZE

1. *E. MICROTHECUM* Nutt. Low to tall, spreading to erect, open
to compact subshrubs or shrubs 0.4--10 dm high, 0.3--1.2 m across;
leaves mostly elliptic, 0.5--2 (2.5) cm long, 0.5--6 mm wide, tom-
entose below, slightly less so to nearly glabrous above, the margin
flat or revolute, the petiole 0.5--5 mm long; stems 1--8 (40) cm
long, tomentose to floccose or glabrous and green; inflorescences
cymose, rather congested and compact, 1--6 (8) cm long, 1--8 cm
wide, tomentose to glabrous; peduncles, when present, up to 1 cm
long, tomentose to glabrous; involucres turbinate, 2--3 (3.5) mm
long, 1.3--2.5 (3) mm wide, tomentose to floccose or rarely glab-
rous, the 5 rounded to triangular teeth (0.3) 0.5--1 mm long; flow-
ers white with green to reddish-brown midribs and bases, 2--3 mm
long, glabrous, the tepals obovate, those of the inner whorl slight-
ly narrower; achenes light brown to brown, 2--3 mm long. -- Wide-

spread desert and montane shrub of e. Wash. s. to s. Calif., e. across Ida., Nev. and Utah to w. Mont., w. Wyo., w. and s. Colo., and into n. Ariz. and nw N.M. Jun-Oct.

The *Eriogonum microthecum* complex is composed of nine varieties found throughout much of the western United States (Reveal 1971). In Arizona and New Mexico, only two variants occur, with var. *laxiflorum* restricted to a few scattered locations in northern Arizona where it often intergrades into the more common and widespread var. *foliosum*. Forms of this species are sometimes confused with the related *E. ericifolium* var. *pulchrum* in eastern Mohave County.

VAR. LAXIFLORUM Hook. [*E. macdougalii* Gandoger. *E. microthecum* ssp. *l.* (Hook.) S. Stokes. *E. microthecum* var. *macdougalii* (Gandoger) S. Stokes.] Low to erect, spreading to sparsely branched subshrubs or low shrubs (1) 2--4 (5) dm high, 2--8 dm across; leaves mostly elliptic, (0.5) 1--2 (2.5) cm long, (1.5) 2.5--6 mm wide, densely to sparsely white-tomentose below, less so to floccose above, the margin plane or with thickened margins, not revolute; stems 2--6 (8) cm long, floccose to sparsely tomentose when young, becoming glabrous or subglabrous and greenish; inflorescences (1) 2--4 (8) cm long, floccose to glabrous; involucre 2--3 (3.5) mm long, mostly subglabrous or glabrous; flowers white, 2--3 mm long. -- Local and restricted mainly on the Kaibab Plateau in n. Ariz., with widely scattered populations near Peach Springs, Mohave Co. and in n. Apache Co.; e. Wash. to w. Mont. s. to e. Calif., s. Nev. and n. Ariz. Jun-Sep.

This variety reaches its southernmost point of distribution in northern Arizona. The type of *Eriogonum macdougalii* represents a population of seemingly intermediate plants between var. *laxiflorum* and var. *foliosum*, with the majority of specimens of the type belonging to typical var. *laxiflorum*.

VAR. FOLIOSUM (Torr. & Gray) Reveal. [*E. effusum* Nutt. var. *g.* Torr. & Gray. *E. simpsonii* Benth. in DC. *E. m.* var. *rigidum* Eastw. *E. e.* ssp. *s.* (Benth. in DC.) S. Stokes. *E. e.* ssp. *r.* (Eastw.) S. Stokes.] Low to erect, spreading to sparsely branched subshrubs or shrubs 1--10 dm high, 1--12 dm across; leaves mostly narrowly elliptic, 0.5--1.8 (2) cm long, (0.5) 1--2 (2.5) mm wide, densely white-tomentose below, floccose and whitish-green above, rarely subglabrous or glabrous and green above as in eastern Arizona and northwestern New Mexico, the margin revolute; stems 2--7 (40) cm long, densely lanate to tomentose or rarely subglabrous and greenish in plants with stems up to 40 cm long; inflorescences (1.5) 2--4 (6) cm long, tomentose to floccose or rarely subglabrous at maturity in northwestern New Mexico; flowers white, 2--3 mm long. -- Clay hills and slopes to rocky and gravelly places often on limestone outcrops from Mohave Co., Ariz. e. to Rio Arriba Co., N.M., then s. to Yavapai Co., Ariz., and from Valencia Co. to Torrance Co., N.M.; s. Calif. and Nev. e. across s. and e. Utah to w. and s. Colo., n. Ariz. and nw. N.M. Jun-Oct.

The var. *foliosum* is currently defined to include at least

three discordant elements. The types of *Eriogonum effusum* var. *foliosum*, *E. simpsonii*, and *E. microthecum* var. *rigidum* represent a low, compact plant with narrowly revolute leaves, compact inflorescences, and a stature of something less than 5 dm. In parts of northeastern Arizona, and especially in northwestern New Mexico, a second phase of var. *foliosum* occurs which may be recognized by its narrowly revolute leaves, small and compact inflorescences, but a stature that varies from 5 to 10 dm. These latter plants are often remarkably glabrous, bright green in color especially on the stems and branches, and tend to be strictly erect and not spreading as is found in typical var. *foliosum*. The third aspect of the taxon is known to me only from herbarium material randomly gathered on the eastern fringe of the taxon's range in central New Mexico. It too has narrowly revolute leaves but which tend to be longer and narrower (by and large) from the other phases, with a somewhat longer inflorescences that tends to be more branched, and by a stature that varies from 4 to 6 dm. Unlike all other forms of the species, however, this third phase blackens upon drying and in the herbarium is very distinctive. All of these phases tend to blend into one another across northern Arizona and New Mexico, but when observed singly can be striking.

2. *E. RIPLEYI* J. T. Howell. Low, heavily branched subshrubs 0.5--1.5 (2) dm high, 0.5--3 (5) dm across; leaves narrowly oblanceolate, 2--6 mm long, 0.5--1 mm wide, densely white-tomentose below, thinly floccose to villous and greenish above, the margin strongly revolute, the petiole (0.5) 1--1.5 mm long; stems indistinguishable from the other branches, woody; inflorescences reduced to a cymose-umbel consisting entirely of a single involucre arising from the apex of each erect shoot; bracts lacking; peduncles slender, thinly floccose, 1--10 mm long, erect, terminating the erect shoot; involucre solitary, campanulate, 3--3.5 mm long and wide, thinly floccose or villous to subglabrous without, the 3--5 unequal acute teeth 0.7--1 mm long; flowers white with reddish-brown midribs and bases, 3.5--4.5 mm long, glabrous, the tepals dimorphic, the outer tepals suborbicular, 3--3.5 mm long, 3.5--4 mm wide, the inner tepals broadly obovate, 2.8--3.2 mm long, 2--2.5 mm wide; achenes light brown to brown, 2--2.5 mm long. -- Rare and restricted to sandy clay soil on the edges of sandstone mesas associated with pinyon-juniper, sw. of Frasier's Well and near Peach Springs in sw. Coconino and adjacent e. Mohave cos., and at the n. end of Horseshoe Dam on calcareous soils, Yavapai Co., Ariz. Apr-Jun.

This species is "threatened" because of its attractiveness to gardeners, the heavy overgrazing of the Hualapai Indian Reservation and the increased use of the Horseshoe Dam area as a recreational facility. The species was described by Howell in 1944.

3. *E. ERICIFOLIUM* Torr. & Gray. Low spreading pulvinate subshrubs 0.5--0.9 (1.2) dm high, 0.8--2 (3.5) dm across; leaves oblanceolate to narrowly elliptic, 5--8 mm long, 0.8--1.5 (2) mm

wide, densely white-tomentose below, glabrous and green to floccose and whitish-green above, the margin revolute or at least thickened, the petiole 1.5--2 mm long; stems slender, 0.3--2 cm long, floccose to slightly tomentose, the area among the leaves remaining floccose to tomentose or rarely glabrate; inflorescences cymose-umbellate, compact and congested, 0.5--1 cm long, 0.5--1.5 cm wide, sparsely tomentose to floccose; peduncles lacking; involucre solitary, turbinate, 2.5--3 mm long, 1.5--2 mm wide, slightly pubescent without, the 5 acute teeth 0.4--1 mm long; flowers white with reddish-brown midribs, becoming tinged with pink or red to rose at maturity, 2--2.5 mm long, glabrous, the tepals dimorphic, those of outer whorl broadly obovate to nearly orbicular, 2--2.5 mm wide, those of the inner whorl oblanceolate to oblong, 0.8--1.2 mm wide; achenes light brown, 2--2.5 mm long. -- Dry gravelly to rocky sites in pinyon-juniper woodlands from extreme Mohave Co. e to s. Navajo Co., with isolated populations in Yavapai Co., Ariz., and San Bernardino Co., Calif. Aug-Oct.

VAR. PULCHRUM (Eastw.) Reveal. [*E. p.* Eastw. *E. microthecum* Nutt. ssp. *p.* (Eastw.) S. Stokes. *E. mearnsii* Parry in Britton var. *p.* (Eastw.) Kearney & Peebles.] Low spreading subshrubs 0.8--1.2 dm high; leaves 5--8 mm long, floccose and whitish-green above, slightly revolute or with thickened margins; flowers 2--2.5 mm long, the outer tepals nearly orbicular, 2--2.5 mm wide. -- Often common and widespread in n. Ariz. from extreme e. Mohave Co. e. across se. Coconino Co. into s. Navajo Co., mostly along the Mogollon Rim.

This is the common phase of the species, and is frequently encountered in southeastern Coconino and southern Navajo counties. The one known collection from the Toroweap Point area of Mohave Co. is somewhat similar to *Eriogonum microthecum*, and the two are difficult to separate in this area.

VAR. ERICIFOLIUM. [*E. mearnsii* Parry in Britton. *E. fasciculatum* Benth. var. *e.* (Torr. & Gray) M. E. Jones. *E. microthecum* Nutt. ssp. *e.* (Torr. & Gray) S. Stokes. *E. microthecum* ssp. *m.* (Parry in Britton) S. Stokes.] Low spreading subshrubs 0.5--0.8 dm high; leaves 5--6 mm long, glabrous and green above, tightly revolute; flowers 2.5--3 mm long, the outer tepals obovate, 2 mm wide. -- Rare and exceedingly local, known only from near Prescott and Camp Verde, Yavapai Co., Ariz. Aug-Oct.

At one time I thought this taxon was possibly extinct, as it was known to me (Reveal 1971) from only two collections, the type of *Eriogonum ericifolium* and the type of *E. mearnsii*. Since then I have located two additional collections made by H. Scott Gentry on Prescott Mountain (Gentry 3093) and in Verde River Valley (Gentry 3986); both were gathered in the late 1930s. I still regard the taxon as "endangered". Recently, a third form of the species has been described. This is var. *thornei* Reveal & Henrickson (1975) from the New York Mountains, San Bernardino Co., California. It is most closely related to var. *ericifolium*.

4. *E. LEPTOPHYLLUM* (Torr. in Sitgr.) Wooton & Standley. [*E. effusum* Nutt. var. *l.* Torr. in Sitgr. *E. microthecum* Nutt. var. *l.* (Torr. in Sitgr.) Torr. & Gray.] Large, rounded, heavily-branched shrubs 2--6 dm high, 0.3--1 m across; leaves linear to linear-oblongate, (1.5) 2--6 cm long, (0.8) 1--2.5 (3) mm wide, densely to thinly white-tomentose below, glabrous and green above, the margin tightly revolute, the petiole 0.4--1 mm long; stems 1--8 cm long, glabrous; inflorescences cymose, dense and broomlike with numerous glabrous branches, 2--15 cm long, 4--15 cm wide; involucre narrowly turbinate, 2--3 mm long, 1.1--1.7 (2) mm wide, glabrous, the 5 acute teeth 0.3--0.7 mm long; flowers white with greenish-brown midribs and bases, 2.5--4 mm long, glabrous, the tepals oblong to narrowly obovate; achenes brown, 3.5--4 mm long. -- Local and frequently common from se. Utah and sw. Colo. s. to ne. Ariz. and nw. N.M., ranging from extreme e. Coconino Co. e. to Taos Co. s. to Bernalillo Co. Jul-Oct.

This is one of the more elegant shrubs in the genus, and on the barren clays and volcanic soils of northwestern New Mexico, the bright green foliage and white flowers of *Eriogonum leptophyllum* can make a spectacular sight. The thin to slender branches of the inflorescence, coupled with their density, make this species easy to distinguish from *E. microthecum*.

5. *E. EFFUSUM* Nutt. [*E. microthecum* Nutt. var. *e.* (Nutt.) Torr. & Gray.] Diffusely branched shrubs (1.5) 2--5 (7) dm high, 0.3--1.5 m across; leaves oblongate to oblong, (1) 1.5--3 cm long, (2) 3--7 mm wide, densely white- to gray-tomentose below, white-floccose to glabrate or glabrous and green (rare in our area) above, the margin plane, the petiole 2--7 mm long; stems slender to stoutish, 3--8 cm long, floccose to glabrous; inflorescences densely cymose, diffuse and usually congested or (in western New Mexico) open, 1--3 (4) dm long, floccose to glabrate; peduncles, when present, slender and up to 2.5 cm long, mostly floccose and restricted to the lower nodes; involucre turbinate, 1.5--2.5 (3) mm long, sparsely floccose without, the 5 minute acute to triangular teeth 0.3--0.6 mm long; flowers white with greenish or reddish midribs and bases, 2--4 mm long, glabrous, the tepals elliptic to obovate, the inner tepals slightly narrower; achenes brown, 2--3 mm long. -- Dry rocky slopes to sandy plains or infrequently on clay, chalky, or gypsum outcrops in the Great Plains from w. S.D. and e. Wyo. s. to s. Colo., and in the mountains of se. Wyo. s. through central Colo. to n.-central and nw. N.M.; from e. San Juan Co., N.M. e. to Union Co. s. to Socorro Co. Jun-Sep.

In New Mexico, *Eriogonum effusum* presents a difficult set of problems which even now are not totally resolved. The isolated Socorro Co. population (Reveal & Davidse 918) is rather typical of the kind of plant one finds of this species in Colorado, Wyoming, and Nebraska. The populations which occur from San Juan Co. to Sandoval Co., on the other hand, are unique as they differ in being more open, robust plants with dense tomentum, somewhat larger leaf-blades, and an inflorescence that is composed of fewer branches

with generally widely scattered involucre. In north-central New Mexico, these plants appear to be more similar to the general aspect of *E. effusum* than the plants of San Juan Co. In the latter area, the plants clearly grade morphologically into *E. leptocladon* in a gross fashion. However, the two do not seem to hybridize as when the two species have died back in the winter, the over-wintering plants of *E. leptocladon* are reddish, and those of *E. effusum* are grayish, and the two can be easily distinguished. As one may note from the distribution map of *E. effusum* var. *effusum* published in 1971 (Reveal 1971, fig. 24), the New Mexico plants are well isolated from the remaining populations of the species, and continued research may ultimately reveal a need to distinguish the northwestern populations of this species as a distinct taxon.

6. *E. CORYMBOSUM* Benth. in DC. Low spreading shrubs (ours) or subshrubs (2) 3--8 (12) dm high, 0.4--1.5 (2) m across; leaves lanceolate to oblanceolate or elliptic to nearly orbicular, 1--3 (4.5) cm long, (0.3) 0.5--3 (3.5) cm wide, densely white-tomentose on both surfaces or less so to subglabrous or glabrous and green above in some, the margin entire or crenulate, not revolute, the petiole 2--15 mm long; stems (0.5) 1--2 dm long, tomentose to subglabrous or rarely glabrous; inflorescences cymose, (1) 2.5--20 cm long, 2--30 cm wide, tomentose to glabrous; involucre turbinate, 1.5--3.5 mm long, 1--2 (2.5) mm wide, tomentose to glabrous without, the 5 acute teeth 0.3--1 mm long; flowers white with greenish or reddish midribs and bases, whitish-brown with reddish bases, or yellow with reddish bases, 2.5--3.5 (4) mm long, glabrous, the tepals oblanceolate to spatulate, the inner tepals slightly narrower; achenes brown, 2--2.5 (3) mm long. -- Rather common on clay hills and flats or on rocky outcrops from sw. Wyo. s. through e. and s. Utah to n. Ariz., and e. to w. Colo and n. N.M., with an isolated population in s. Nev. Jul-Oct.

Since my revision of this species complex (Reveal 1968b), I have modified my views on this species, even to the point of recognizing one element I regarded as a synonym in 1968 (var. *divaricatum* Torr. & Gray) and another I reduced in 1973 (Reveal 1973), var. *revealianum* (S. L. Welsh) Reveal (Welsh, et al. 1976). As for the species, as it occurs in Arizona and New Mexico, I have now found specimens of var. *velutinum* Reveal in extreme eastern Arizona, and have found var. *orbiculatum* (S. Stokes) Reveal & Brotherson in northwestern New Mexico. The following key should discriminate among the various taxa in the two states.

KEY TO THE VARIETIES

- A. Flowers white to brownish-white, not yellow.
- B. Leaves oblanceolate to elliptic, 1--3 (4.5) cm long, 1--2 cm wide, the petiole 2--6 mm long; branches white-tomentose; northern Arizona var. *corymbosum*
- BB. Leaves elliptical-oblong to nearly orbicular, 1--3 (4) cm long, 1--3 (3.5) cm wide, the petiole 5--10 (15) mm long,

- C. Plants greenish; leaves mostly thinly tomentose below, subglabrous to glabrous and green above; flowers 2.5--3 mm long; mostly in sandy places, northeastern Arizona and northwestern New Mexico var. *orbiculatum*
- CC. Plants brownish-white; leaves densely tomentose below, floccose above; flowers 2--2.5 mm long; mostly on clay hills and rocky outcrops, northern New Mexico and east central Apache Co., Arizona var. *velutinum*
- AA. Flowers yellow; stems and branches glabrous to floccose; northern Arizona var. *glutinosum*

VAR. CORYMBOSUM. [*E. effusum* Nutt. ssp. c. (Benth. in DC.) S. Stokes.] Subshrubs to shrubs 3--8 dm high, the crown suberect to subglobose, up to 1 m across; leaves lanceolate to oblanceolate or elliptic, 1--3 (4.5) cm long, (0.3) 0.5--1 (1.5) cm wide; inflorescences 3--10 cm long, usually densely tomentose; involucre 1.5--2.5 mm long, 1--1.5 mm wide; flowers white, 2--3 (3.5) mm long. -- Dry clay hills and rocky outcrops in e. Mohave and Coconino cos., Ariz.; widespread from e. Utah and w. Colo. s. to n. Ariz. Jul--Sep.

VAR. ORBICULATUM (S. Stokes) Reveal & Brotherson. [*E. effusum* Nutt. ssp. o. S. Stokes.] Large compact and hemispheric shrubs (3) 5--12 dm high, 0.5--2 m across; leaves mostly orbicular, 1--3 cm long and wide, floccose to thinly tomentose on both surfaces, usually deep green; inflorescences dense, up to 2 dm long and 3 dm across, of rigid branches; flowers white, 2.5--3 mm long. -- In sandy soil mainly in the Colorado River drainage from north-central Coconino Co. e. across Navajo and Apache cos., Ariz. to San Juan and McKinley cos., N.M.

The New Mexico plants approach var. *velutinum*, but by and large can be distinguished by the more open habit and more dense tomentum than var. *orbiculatum*. The var. *orbiculatum* is best developed in the Four Corners area, and especially in Monument Valley.

VAR. VELUTINUM Reveal. Large shrubs 5--10 dm high, 0.5--2 m across; leaves mostly oblong, 2--2.5 (3.5) cm long, 1.5--2.5 (3) cm wide, densely tomentose below, floccose and whitish above; inflorescences dense to + open, 4--10 cm long, of stout but not rigid branches; flowers brownish-white, 2--2.5 mm long. -- Usually on clay soils or rocky outcrops of se. Utah, sw. Colo., e. Ariz., and nw. N.M.; from Apache Co., Ariz. e to Sandoval and Santa Fe cos. s. to Socorro Co., N.M. Jul--Oct.

In my 1968 revision (Reveal 1968b), I considered this variant to be restricted to New Mexico. In my review of the genus for the state of Utah, I expanded the range to include a series of plants in San Juan Co. and a few scattered individuals in adjacent southwestern Colorado (Reveal 1973). At that time, I mentioned that var. *velutinum* also occurred in eastern Arizona, but did not give any details. My few Arizona specimens are from the Many Farm and Kayenta areas of Apache Co.

VAR. GLUTINOSUM (M. E. Jones) M. E. Jones. [*E. aureum* M. E. Jones. *E. a.* var. *g.* M. E. Jones. *E. fruticosum* A. Nels. *E. f.* var. *g.* (M. E. Jones) A. Nels. *E. microthecum* Nutt. ssp. *a.* (M. E. Jones) S. Stokes.] Low subshrubs to large rounded shrubs 2--10 dm high, (3) 5--20 dm across; leaves lanceolate to oblanceolate or elliptic, 1--4 cm long, 0.5--1.5 cm wide; inflorescences 3--10 cm long, glabrous to tomentose; involucre 1--2 mm long, 1--1.5 (2) mm wide; flowers yellow, 1.5--2.5 mm long. -- Rather common in sandy to gravelly or even rocky places throughout much of n. Ariz. from Mohave Co. e. to Apache Co.; s. Utah and s. Nev. Jul-Oct.

For the most part, the var. *glutinosum* may be easily distinguished by the yellow flowers which so strikingly set this plant apart from the desert landscape in the volcanic areas of northern Arizona. However, around House Rock in Coconino Co., var. *glutinosum* intergrades with var. *corymbosum* producing a series of individuals which vary from pale yellow to bright yellow in terms of flower color, and from densely tomentose to nearly glabrous in terms of stem and branch tomentum. The two are usually slightly separated either elevationally or edaphically throughout their overlapping range. The continued attempt to maintain the yellow flowered phase as a distinct species (McDougall 1973) is unwarranted.

7. E. FENDLERIANUM (Benth. in DC.) Small. [*E. microthecum* Nutt. var. *f.* Benth. in DC. *E. ainslei* Wooton & Standley. *E. effusum* Nutt. ssp. *f.* (Benth. in DC.) S. Stokes. *E. e.* var. *a.* (Wooton & Standley) S. Stokes.] Low subshrubs or shrubs (1) 1.5--4 (5) dm high, 2--6 (8) dm across; leaves lanceolate to elliptic, 1.5--4 (5) cm long, (0.3) 0.5--2 cm wide, entire or crenulate along the margin, densely white-tomentose below, subglabrous to glabrous and greenish above, the petiole 5--20 mm long; stems 3--15 (20) cm long, densely tomentose among the leaves below, glabrous or rarely floccose above; inflorescences open, 2--10 cm long; involucre turbinate to turbinate-campanulate, 2.5--3.5 (4) mm long, 1.5--3.5 mm wide, glabrous or essentially so without, the 5 acute teeth 0.5--1 mm long; flowers white with brownish midribs and bases, 2.5--3.5 (4) mm long, glabrous, the tepals elliptic to oblong, those of the inner whorl slightly narrower; achenes brown, 2--2.5 mm long. -- Local and often rather common on clay or barren hillsides or outcrops, from sw. Colo. to e. Colo. and s. to ne. N.M. and adjacent Tex.; from Rio Arriba Co. to Colfax Co., with an isolated population in Quay Co., N.M. Jun-Oct.

My own understanding of this species is currently undergoing some revision and I may ultimately modify the concept of the species as presented in 1968 (Reveal 1968b). The problem has to do with the exact identity of the Fendler type of var. *fendlerianum* which was collected at Rock Creek in Taos Co., New Mexico. The plants of western Colorado that I associated with this name may be better associated with *E. lonchophyllum* Torr. & Gray. However, the type of var. *fendlerianum* may ultimately fall into this category, and if so then the next available name for the plants of south-central

Colorado and Colfax and Quay counties of New Mexico is *E. ainslei*. Until I can do the necessary field work, this small problem must remain unresolved.

8. *E. JONESII* S. Wats. [*E. lanosum* Eastw.] Low, spreading subshrubs 2--4.5 dm high, 3--8 dm across; leaves sheathing up the lower stems, cordate, (1.5) 2--2.5 cm long, 1--2 (2.5) cm wide, densely white-tomentose below, floccose and greenish- or brownish-white above, the margin entire or crenulate, the petiole 1.5--3 cm long; stems tomentose, densely so among the leaves below, becoming less so to merely floccose above, 1--2.5 dm long; inflorescences mostly open, cymose, 3--15 cm long, tomentose; involucre turbinate, 1.5--2 mm long, 1--1.3 mm wide, tomentose without, the 5--6 acute teeth 0.5--0.8 mm long; flowers brownish-white with brownish-red midribs and bases, 2--3 mm long, glabrous, the tepals dimorphic, the outer tepals obovate, 1.8--2 mm wide, the inner tepals lanceolate to narrowly elliptic, 1--1.2 mm wide; achenes light to dark brown, 2--2.5 mm long. -- Local and often infrequent in sandstone, limestone, or otherwise rocky areas in protected sites in n. Ariz. from extreme e.-central Mohave Co. e. across central Coconino Co. to extreme w. Navajo Co. Aug-Oct.

Since my review of this species (Reveal 1968e), little additional information has been obtained upon the taxon except in terms of additional locations where it grows. It is doubtful that McDougall (1973) saw my review as the species is more widespread than he indicates, and one of the many typographical errors of his book would seem to imply that the involucre is both tomentose and glabrous.

9. *E. LEPTOCLADON* Torr. & Gray. Large erect to spreading diffusely branched shrubs (2) 3--10 (13) dm high, 0.5--1.5 (2) m across; leaves linear-lanceolate to linear-oblancheolate or narrowly oblong, 1.5--4.5 cm long, 2--8 mm wide, densely white-tomentose below, less so and often greenish above, the margin slightly revolute in some, the petiole 2--5 mm long; stems 3--10 cm long, tomentose to floccose or glabrous; inflorescences large, open, cymose, 1--4 dm long, 1--5 dm across, lightly tomentose to floccose or glabrous, the involucre racemosely arranged at the tips of the branches and branchlets; involucre turbinate to turbinate-campanulate, 1.5--3 mm long, 1--2 mm wide, tomentose to glabrous without, the 5 acute to rounded teeth 0.4--0.7 mm long; flowers white or pale-yellow to yellow with reddish-brown to brown midribs and bases, (2) 2.5--3.5 mm long, glabrous, the tepals obovate to nearly fan-shaped; achenes light brown, 2.5--3.5 mm long. -- Sandy places mainly on flats and gentle slopes from e. Utah s. to ne. Ariz. and nw. N.M.; local and frequently abundant from Coconino Co., Ariz. e. to San Juan Co., N.M.

The var. *leptocladon* occurs only in eastern Utah, and is distinguished from the two variants reported here in having yellowish flowers and thinly pubescent stems and branches.

VAR. *RAMOSISSIMUM* (Eastw.) Reveal. [*E. r.* Eastw. *E. eastwoodae*

M. E. Jones. *E. pallidum* Small. *E. effusum* Nutt. var. *p.* (Small) S. Stokes.] Stems tomentose to floccose; flowers white. -- Common in sandy places in e. Utah, sw. Colo., ne. Ariz., and nw. N.M.; from Coconino Co., Ariz. e. across the n. tier of cos. to San Juan Co., N.M. Jun-Oct.

In an early review of this species (Reveal 1966), I associated a small series of western Arizona plants with var. *ramosissimum*, but subsequent field work in Mohave Co., Arizona, and Washington Co., Utah, show these populations to be *Eriogonum kearneyi*.

VAR. PAPILIUNCULI Reveal. Stems glabrous; flowers white. -- Local and often rare in s.-central Utah, ne. Ariz., and nw. N.M.; in moving sands from near Page, Coconino Co. e. to Monument Valley, Ariz., and in Cutler Canyon, San Juan Co., N.M. Aug-Oct.

Although this taxon was just recently described (Reveal 1974a) specimens of it have been known for many years and associated with either *Eriogonum corymbosum*, the var. *ramosissimum*, or left unnamed. In the Page area, the taxon is rather common, and seems to be an important plant in stabilizing sand dunes.

10. *E. KEARNEYI* Tidestr. [*E. nodosum* Small var. *k.* (Small) S. Stokes.] Low to tall spreading subshrubs or shrubs 2--8 dm high, 0.3--1 (1.3) m across; leaves broadly oblanceolate to elliptic, 1--2.5 (3) cm long, 4--12 (15) mm wide, densely white-tomentose below, slightly less so and greenish above, the margin not revolute, the petiole 2--10 mm long; stems 5--10 cm long, tomentose; inflorescences large, open, cymose, 0.5--5 dm long, 0.5--8 dm across, tomentose, the involucre racemously arranged at the tips of the branches; peduncles, when present, up to 5 mm long, tomentose; involucre turbinate, 2--2.5 mm long, 1.5--2 mm wide, tomentose without, the 5 acute teeth 0.1--0.4 mm long; flowers white with reddish to reddish-brown midribs and bases, 1.5--3 mm long, glabrous, the tepals obovate, those of the inner whorl slightly narrower; achenes light brown, 2--3 mm long. -- Sandy places in w. and sw. Utah s. to nw. Ariz., then w. across the s. half of Nev. to e. Calif.; rare and local, known only from n. Mohave Co. and w. Coconino cos. in Ariz. Jul-Sep.

In Kane Co., Utah, and adjacent portions of northern Coconino and Mohave cos., Arizona, the distinction between this species and *Eriogonum leptocladon* var. *ramosissimum* is somewhat subjective. For the most part, the leaves of *E. kearneyi* are shorter and broader than those of var. *ramosissimum*, and this is about the only simple feature that can be used to separate the two. Once both are known, however, the denser degree of tomentum of *E. kearneyi* will be noted as will the more clustered arrangement of the involucre at the tips of the branches in *E. kearneyi* when compared with *E. leptocladon*. Unlike the type of over-winter distinction that can be made between the New Mexico populations of var. *ramosissimum* and *E. effusum*, the dried shrub color of the two Arizona plants is essentially the same. The Arizona plant is var. *kearneyi*, with the var. *monoense* (S. Stokes) Reveal restricted to eastern California.

11. *E. MORTONIANUM* Reveal. Large erect totally glabrous shrubs 4--8 (10) dm high, 0.5--1 (1.3) m across; leaves elliptic, 1.5--4 (4.5) cm long, (3) 6--10 (12) mm wide, the margin thickened but not revolute, the petiole (2) 3--8 (10) mm long; stems 5--10 (12) cm long; inflorescences large, open, cymose, 15--25 cm long, 15--30 cm wide, pale yellowish-green; involucre turbinate, 2--2.5 mm long, 1.2--1.8 (2) mm wide, the 5 acute teeth 0.3--0.4 mm long; flowers pale-yellow or white, (2) 2.5--3 mm long, glabrous, the tepals obovate, those of the inner whorl slightly narrower; achenes light brown, 3--3.5 mm long. -- Restricted to red clay hills 4.5 mi sw. of Fredonia in Mohave Co., Ariz. Jul-Sep.

This newly described species (Reveal 1974a) is considered to be "endangered" first because of its rareness and close association with Arizona Highway 389, and secondly because of the overgrazing noted on the Kaibab Indian Reservation upon which land the species is restricted. The species grows with two other species which are considered endangered or threatened, *Eriogonum thompsonae* var. *atwoodii* and *Cryptantha subglabra* Barneby.

12. *E. FASCICULATUM* Benth. var. *POLIFOLIUM* (Benth. in DC.) Torr. & Gray. [*E. p.* Benth. *E. revolutum* Goodding. *E. f.* ssp. *p.* (Benth. in DC.) S. Stokes. *E. f.* var. *r.* (Goodding) S. Stokes.] Low rounded and + compact or spreading subshrubs or shrubs 2--5 (8) dm high, 3--10 dm across; leaves fascicled, mostly oblanceolate, 6--18 mm long, (1) 2--6 mm wide, often revolute, canescent on both surfaces or tomentose below and canescent above; stems 3--15 cm long, thinly tomentose to canescent; inflorescences congested or nearly so, occasionally umbellate and open; involucre turbinate to turbinate-campanulate, 2.5--3.5 mm long, 2--3.5 mm wide, pubescent without; flowers white to pink, 2.5--3 mm long, pubescent without on the base and midrib; achenes light brown, 2--2.5 mm long. -- Rocky places mostly in the low desert ranges of nearly all but the ne. portion of Ariz.; widespread and common from sw. Utah s. to w. and s. Ariz., w. to Baja Calif. and e. Calif. Apr-Jul (Oct).

This is one of the more common desert shrubs, and probably the most abundant shrubby species of the genus *Eriogonum* in Arizona. It is the only large shrub of the genus with pubescent flowers, and as such may be quickly identified. The var. *flavoviride* Munz & I. M. Johnston may eventually be found in western Yuma Co. It differs from var. *polifolium* in being yellow-green in color instead of grayish, and having glabrous peduncles and involucre. A second shrubby species with pubescent flowers that may eventually be seen in extreme southwestern Yuma Co. is *E. deserticola* S. Wats. It differs from var. *polifolium* in having yellow-colored flowers that are densely covered with white hair; it also flowers from September to December, and occurs only on deep, moving sands.

13. *E. HEERMANNII* Dur. & Hilg. Low spreading to large erect and rounded subshrubs or shrubs 1--20 dm high, 1--25 dm across; leaves linear, oblanceolate to spatulate or oblong-lanceolate,

(0.5) 1--2 (3) cm long, 1--8 mm wide, tomentose to thinly floccose or glabrous below, thinly floccose to glabrous above, the margin usually plane or only slightly revolute, the petiole 3--10 mm long; stems slender to stout, 0.3--4 cm long, floccose to glabrous, smooth to scabrellous, terete or angled; inflorescences open to densely clustered cymes with rigid branches, 1--20 (25) cm long and wide, floccose to glabrous, smooth to scabrellous, terete or angled and deeply grooved; involucre campanulate, 0.7--2 mm long, 0.8--3 mm wide, glabrous without, the 5 rounded teeth 0.3--0.7 mm long; flowers white to yellowish-white with greenish or reddish midribs and bases, often maturing pinkish or rose, 2--4 mm long, glabrous, the tepals dimorphic, those of the outer whorl obovate to orbicular, those of the inner whorl lanceolate to oblong; achenes light brown to brown, 2--2.5 mm long. -- Widespread in rocky or gravelly places usually on limestone outcrops or infrequently on sandstone ledges from s. and e. Calif. e. to sw. Utah and nw. and n.-central Ariz.; in widely scattered locations mainly in Mohave and Coconino cos. Jun-Oct.

As now defined, *Eriogonum heermannii* is composed of eight varieties. The most common and widespread phase is var. *humilius* (S. Stokes) Reveal of eastern California and Nevada. The typical variety is restricted to southern California and is close related to a coastal montane phase, var. *occidentale* S. Stokes. Two other forms of the species may eventually be found in Mohave Co., Arizona. The more likely of the two is var. *floccosum* Munz which is known from eastern San Bernardino Co., California, and southern Clark Co., Nevada. It differs from all Arizona forms in having the stems and branches densely floccose. The other form is var. *clokeyi* Reveal¹, a taxon now known only from northwestern Clark Co. and southern Nye Co., Nevada. It differs from all other forms of the species in having the involucre racemosely arranged along the branches, and in being a more open and spreading plant than is usually the situation. The following key will distinguish the three varieties of the species known to occur in Arizona.

KEY TO THE VARIETIES

- A. Stems not sharply and deeply angled.
 - B. Involucre + racemosely arranged at the very tips of stout branches, the open branches strongly scabrous-papillate; local and rare, Coconino and Navajo cos.
-
- var. *subracemosum*

¹*Eriogonum heermannii* Dur. & Hilg. var. *clokeyi* Reveal, var. nov. A var. *heermannii* et var. *humilius* involucre racemosely arranged. -- TYPUS: Lee Canyon, 7 miles southwest of U.S. Highway 95, Spring Mountains, 5400 feet elevation, Clark Co., Nevada, 10 Aug 1966, Holmgren & Reveal 2990. Holotype, US. Isotypes, ARIZ, BRY, CAS, CS, DAO, DS, IDS, ISC, KSC, MO, NY, OKL, OSC, RENO, RSA, UC, UTC, WTU. This same variety was collected by Ira W. Clokey (Clokey & Clausen 8682) and is widely distributed in numerous herbaria.

- BB. Involucres not racemosely arranged at the tips of the branches, or if so, then the branches slender, diffuse, scabrellous; Mohave and western Coconino cos
 var. *argense*
- AA. Stems sharply and deeply angled, not smooth, the stems rigid yet slender; northern Mohave and Coconino cos . var. *sulcatum*

VAR. SUBRACEMOSUM (S. Stokes) Reveal. [*E. howellii* S. Stokes var. *s.* S. Stokes.] Low spreading subshrubs 3--6 dm high, 3--8 dm across; leaves lanceolate, 5--8 mm long, 1.5--2 mm wide, tomentose below, less so or more commonly glabrous above, \pm revolute in some, the petioles 5--10 mm long; inflorescences open, composed of stout, heavy, often \pm spine-tipped branches, 1--1.5 dm long, 1--2 dm wide, papillate-scabrellous throughout; involucres 1--1.5 mm long, 1.5--2 mm wide; flowers yellowish-white, 1.5--2 mm long. -- Restricted to limestone or more frequently sandstone ledges and outcrops in n. Coconino Co. and in n. Navajo Co., Ariz. Aug-Sep.

My inclusion of this taxon in Utah (Reveal 1973) was based on specimens of what now appear to be var. *argense*.

VAR. ARGENSE (M. E. Jones) Munz. [*E. sulcatum* S. Wats. var. *a.* M. E. Jones. *E. howellii* S. Stokes. *E. howellii* var. *a.* (M. E. Jones) S. Stokes.] Low spreading highly branched and divaricate shrubs 1--5 dm high, 2--6 (8) dm across; leaves linear to linear-lanceolate, 5--10 mm long, 1--3 mm wide, sparsely tomentose to glabrous below, glabrous above, the petiole 3--5 mm long; inflorescences congested and densely branched with numerous slender branches, 3--6 cm long, 5--15 cm across, scabrellous throughout; involucres 0.9--1.3 (1.5) mm long, 0.8--1.2 mm wide; flowers white, (1.5) 1.8--2.5 mm long. -- Locally common in widely scattered locations on limestone rock faces and outcrops from e. Calif. across s. Nev. to extreme sw. Utah, and nw. Ariz.; local and usually rare in n. Mohave Co. and in central Mohave and adjacent w. Coconino cos., Ariz. Jul-Oct.

In reading the description of *Eriogonum heermannii* in McDougall (1973), it would seem his account of the species is based on a mixture of this variant and the typical variant of California.

VAR. SULCATUM (S. Wats.) Munz & Reveal. [*E. s.* S. Wats. *E. h.* ssp. *s.* (S. Wats.) S. Stokes.] Low spreading highly branched and divaricate subshrubs (1) 1.5--3 (4) dm high, 1.5--6 dm across; leaves linear-lanceolate to elliptic or spatulate, 4--12 mm long, 2--5 mm wide, sparsely tomentose below, becoming glabrous at maturity, glabrous above, the petiole 3--5 mm long; inflorescences highly congested and densely branched with numerous slender but rigid branches, 1--3 (5) cm long, 3--10 cm wide, furrowed and angled as well as minutely scabrellous throughout; involucres 0.7--1.3 (1.5) mm long and wide; flowers yellowish-white, 1.5--2 mm long. -- Local and frequently common on limestone or rarely sandstone outcrops from se. Calif. across s. Nev. to sw. Utah, and nw. Ariz.; n. Mohave and Coconino cos., Ariz. Jul-Sep (Oct).

14. *E. APACHENSE* Reveal. Low rounded subshrubs 2--5 dm high, 3--6 dm across; leaves oblanceolate to elliptic, (5) 7--12 (15) mm long, 2--5 (6) mm wide, densely white-tomentose below, sparsely tomentose to floccose and green above, the margin flat, the petiole 1--5 mm long; stems slender, 0.5--2 cm long, glabrous and scabrelous; inflorescences cymose, 1--2 dm long, 1--2.5 dm wide, composed of several rather rigid and erect to spreading branches, glabrous and scabrelous throughout; involucre narrowly turbinate, 1--1.8 mm long, 0.7--1.3 mm wide, glabrous without, the 5 rounded teeth 0.3--0.5 mm long; flowers white with reddish or greenish midribs and bases, becoming reddish to rustic in age, (2.5) 3--4 mm long, glabrous, the tepals dimorphic, those of the outer whorl ovate, those of the inner whorl narrowly lanceolate; achenes light brown, 2.5--3 mm long. -- Local and often rare, known from nw. of Bylas, Graham Co. and s. of Vail, Pima Co., Ariz. Sep-Nov.

This species is closely related to *Eriogonum heermannii*, and the two differ only in a series of fine details, but in a substantial ecological and distributional manner. Since I described the species (Reveal 1969) I have learned that Marcus E. Jones collected the species south of Vail in Pima Co. I have been unable to relocate this collection site. In the type area, the plants are restricted to gypsum outcrops in scattered pinyon-juniper. In my opinion, the species is "threatened" due to its proximity to U.S. Highway 70.

15. *E. PLUMATELLA* Dur. & Hilg. [*E. palmeri* S. Wats. *E. nodosum* Small var. *jaegeri* Munz & Johnston. *E. plumatella* var. *j.* (Munz & Johnston) S. Stokes.] Open erect shrubs 3--6 dm high, 3--8 dm across, woody only at the base; leaves oblanceolate to oblong-lanceolate, 6--15 mm long, 2--4 mm wide, tomentose on both surfaces, the margin entire, the petiole 1--5 mm long; stems stout and usually short-persistent (2 years or less), tomentose or glabrous; inflorescences open, composed of horizontal branches with tiers arranged on one side of the main axis and forming masses of intricately divaricated branches, 1.5--4 dm long and wide, tomentose or glabrous; involucre turbinate, 2--2.5 mm long, 1.5--2 mm wide, glabrous without, the 5 acute teeth 0.5--0.8 mm long; flowers pale yellow to white with brownish-red to greenish midribs and bases, 2--2.5 mm long, glabrous, the tepals slightly dimorphic, obovate, those of the inner whorl slightly narrower; achenes light brown to brown, 2.5--3 mm long. -- Widespread and often locally common from s. Calif., s. Nev., w. Ariz., and possibly from sw. Utah; local and usually rare in w. Mohave Co., Ariz. Aug-Nov.

For years I have maintained var. *jaegeri* as distinct, more out of respect for the opinions of Philip A. Munz, who proposed the taxon, and Edmund C. Jaeger, the distinguished desert scientist, for whom it was named (Reveal & Munz 1968). Careful field work in southern California shown, however, that the character of the glabrous (var. *jaegeri*) versus tomentose (var. *plumatella*) stems just is not biologically significant, and the variety cannot be maintained.

16. *E. THOMPSONAE* S. Wats. Spreading herbaceous perennials 2--4 (6) dm high, 2--5 dm across; leaves oblong to oblanceolate or elliptic and (2) 3--4.5 (5) cm long, 8--15 mm wide, or linear and 3--8 (10) cm long, 2--4 (6) mm wide, thinly to densely white-tomentose below, usually glabrous and green above, infrequently glabrous on both surfaces, the margin entire, plane or slightly revolute to thickened, the petiole 3--7 cm long; stems erect, 5--25 cm long, glabrous; inflorescences open, cymose, (0.5) 1--3 dm long, glabrous and bright green; peduncles lacking; involucre turbinate, 2--4 mm long, 1--2 mm wide, glabrous, the 5 acute teeth 0.3--0.5 mm long; flowers yellow or white, 3--3.5 mm long, glabrous, the tepals oblong; achenes light brown to brown, 2.5--3 mm long. -- Local and often infrequent to rare in sandy-clay soils on the foothills and flats near the base of sandstone mesas, s. Utah and n. Ariz.; ne. Mohave Co., but to be expected in extreme nw. Coconino Co., Ariz. Jul-Nov.

The species is composed of three distinct and non-intergrading varieties, the two noted here and var. *albiflorum* Reveal of Washington Co., Utah. It differs from the white-flowered var. *atwoodii* in having elliptical leaves 8--15 mm wide. Var. *albiflorum* may be eventually discovered in the Colorado City area of Mohave Co., Arizona.

VAR. THOMPSONAE. Leaves oblong to oblanceolate or elliptic, (2) 3--4.5 (5) cm long, 8--15 mm wide, tomentose below, the margin flat; flowers yellow. -- Sandy-clay hills and flats in s. Utah and n. Ariz.; our few collection from extreme ne. Mohave Co. and to be expected near Fredonia, Coconino Co., Ariz.

Although this variety is known from several (three in Utah and three in Arizona) populations in Washington and Kane cos., Utah, and Mohave Co., Arizona, I have considered the plant "threatened" due to its proximity to highways in Arizona, the town of Kanab in Utah, and heavy recreationally-used areas such as Pipe Springs National Monument in Arizona, and Zion National Park in Utah (Nelson 1976).

VAR. ATWOODII Reveal. Leaves linear, 3--8 (10) cm long including the indistinguishable petiole, 2--4 (6) mm wide, thinly to moderately tomentose below, the margin inrolled or at least thickened; flowers white. -- Clay hills ca 4.5 mi w. of Fredonia in Mohave Co., Ariz. Jul-Oct.

The var. *atwoodii* is considered "endangered" because of its close proximity to Arizona Highway 389 and the heavy overgrazing associated with the Kaibab Indian Reservation; the taxon occurs in the same area as *Eriogonum mortonianum* and *Cryptantha subglabra* as already noted in the discussion of Morton's buckwheat. I would suggest that these low, clay hills west of Fredonia be considered "critical habitats" and protected.

In addition to the endangered nature of var. *atwoodii*, it is of considerable interest because it is clear that it is forming a series of hybrids and backcrosses with *Eriogonum mortonianum* judg-

ing by the glabrous nature of the linear leaves and the somewhat more open and spreading habit of scattered individuals. It will be of some importances to evolutionary biologists to witness this populational interaction between two unrelated taxa of the genus. Hybrids are generally rare in *Eriogonum* in nature, and almost always occur between distantly related species groups. This observation was noted when the type was collected in 1973, and studied again in the summer of 1976. It was not recorded previously, however (Reveal 1974b).

The reference to a shrubby form of *Eriogonum thompsonae* in my discussion of the Utah buckwheats (Reveal 1973) alluded to a small and distinctive population of plants near the western entrance to Zion National Park in Washington Co., Utah. I have observed these plants prior to anthesis on several occasions, and have finally concluded that they are better treated as a form of *E. corymbosum*, and are hereby named *E. corymbosum* var. *matthewsae*.²

17. *E. GYPSOPHILUM* Wooton & Standley. Small erect herbaceous perennial 1.2--2 dm high, 1--2 dm across; leaves cordate to truncate, (1) 1.5--2.5 cm long, 1.5--2.5 (3) cm wide, glabrous except for the margin and midvein, the petiole 3--5 cm long, finely strigose; stems erect, 8--10 cm long, glabrous except for a few minute hairs basally; inflorescences cymose, 4--10 cm long, 5--12 cm wide, glabrous; peduncles erect, 1--3 cm long, becoming shorter above, glabrous; involucre broadly campanulate, 1--1.5 mm long, 2--2.5 mm wide, glabrous, the 5 acute teeth 0.4--0.7 mm long; flowers yellow, 1--1.7 (2) mm long, finely white-pubescent along the midribs and bases without, the tepals lanceolate, those of the inner whorl slightly narrower; achenes light brown, 1.5--1.8 mm long. -- Local and rare on white, gravelly gypsum outcrops in the Seven River Hills sw. of Lakewood, Eddy Co., N.M.

This is one of the more "endangered" species of *Eriogonum*, and has been collected only three times to my knowledge: The type which was gathered by Wooton in 1909, a Barneby collection (Barneby 14464), and a collection of my own (Reveal 2949). All specimens have come from the same area in the Seven River Hills, and a portion of the population has been destroyed by the construction of U.S. Highway 285. If and when that highway is increased to 4 lanes as it has been elsewhere, considerable care will have to be made

²*Eriogonum corymbosum* Benth. in DC. var. *matthewsae* Reveal, var. nov. A var. *corymboso* foliis late ellipticis 2--3 cm longis et 1--1.5 cm latis cum dense lanis subter, caulibus glabris, involucris turbinatis 2--3 mm longis differt. -- TYPUS: On purplish siltstone west of Utah Highway 15, 0.3 mile south of Sprindale near the west entrance to Zion National Park, Washington Co., Utah, 4 Oct 1969, Welsh, Shaw, Matthews & Moore 9509. Holotype, MARY. Isotypes, BRY, UMO, US. The variety is named for M. Eileen Matthews, formerly a graduate student at Brigham Young University who studied the *Gilia latifolia* S. Wats. complex for her Master's Thesis, and an enthusiastic field botanist.

to prevent the total destruction of the species.

The original publication of the species was presented by Wootton and Standley in 1913.

18. *E. BRANDEGEI* Rydb. [*E. spathulatum* A. Gray var. *b.* (A. Gray) S. Stokes.] Low spreading herbaceous perennial 1--2.5 dm high, 1--2 dm across; leaves oblanceolate to elliptic, 1.5--3 (4) cm long, 4--8 mm wide, tomentose on both surfaces, the margin entire and plane, the petiole 1--1.5 cm long; stems erect, 1--2.5 dm long, tomentose to floccose; inflorescences capitate or nearly so; peduncles lacking or up to 3 mm long, thinly floccose to glabrous; involucre congested, 4--8 per head, turbinate, 3.5--5 mm long, 3--4 mm wide, floccose to glabrous, the 5 acute teeth 0.4--1 mm long; flowers white, 3--3.5 mm long, glabrous, the tepals oblanceolate to oblong; achenes brown, 3--3.5 mm long. -- Local and rare in central Colo. and reportedly from n. N.M. Aug-Sep.

I am including this species in the New Mexico flora on the basis of a single, undated collection made by Edward L. Greene which is deposited at ISC and states only "northern New Mexico." I have other specimens from Chaffee and Fremont cos., Colorado, and a Letterman collection (MO) supposedly from Colorado Springs in El Paso Co., Colorado. I am highly suspicious of the location data on both the Greene and Letterman collections. Due to the rareness of this species, I am considering it "threatened".

19. *E. LONCHOPHYLLUM* Torr. & Gray. Spreading herbaceous perennial 1--4 dm high, 1--6 (8) dm across; leaves sheathing up the stem (1) 2--5 (8) cm, linear to linear-oblong or linear-spatulate, lanceolate to narrowly oblanceolate, 2--15 (20) cm long, 2--12 mm wide, tomentose below, floccose to glabrous above, the margin entire or crenulate, plane or revolute, the petiole 5--18 (25) mm long, glabrous to tomentose; stems erect or nearly so, 5--15 (20) cm long, glabrous or rarely floccose (in Colorado); inflorescences cymose, 5--15 (20) cm long, 4--10 cm wide, glabrous; peduncles, when present, up to 3 cm long, erect, glabrous; involucre turbinate, 2--4 mm long, 2--3 mm wide, glabrous, 5-toothed; flowers white with greenish or reddish midribs and bases, (2) 2.5--4 mm long, glabrous, the tepals oblong to obovate; achenes light brown to brown, 3--3.5 mm long. -- Widespread and highly variable in rocky to gravelly places or on clay hills and flats, or in mesic places on the forest floor from w. and s. Colo. s. to n. N.M.; from w. Rio Arriba Co. s. to Sandoval Co. e. to Santa Fe Co., N.M. Jun-Sep.

This species, as now defined, is highly variable and composed of several minor variants, some of which may deserve special recognition. I am proposing one here, var. *nudicaule*, for a series of small plants restricted to the southernmost fringe of the species' range. However, within Colorado are several phases that are much more difficult to resolve, and none is attempted here.

VAR. *LONCHOPHYLLUM*. [*E. salicinum* Greene. *E. scoparium* Small. *E. tristichum* Small. *E. sarothriforme* Gand. *E. effusum* Nutt. ssp.

salicinum (Greene) S. Stokes. *E. nudicaule* (Torr.) Small ssp. *scoparium* (Small) S. Stokes. *E. n.* ssp. *t.* (Small) S. Stokes.] Spreading herbs 1--4 dm high, 1.5--6 (8) dm across; leaves sheathing up the stems 2--8 cm long, the leaf-blades linear to linear-oblong or linear-spatulate, lanceolate to narrowly oblanceolate, 2--15 (20) cm long, 2--12 mm wide; inflorescences cymose, 5--15 (20) cm long, divided 3--5 or more times; involucre 2--4 mm long; flowers white to creamish-white. -- Local and occasionally common from w. and s. Colo. s. to n. N.M.; mainly in pine forest in mesic sites in n. Rio Arriba Co., N.M. Jun-Sep.

The leaves of the New Mexico plants are not nearly as variable as those found in the Colorado plants, as they tend to be on the linear side of the spectrum. However, in extreme northern Rio Arriba Co., south of Chromo, Colorado, the leaves are lanceolate as in the type of the species which was gathered along the White River south of Pagosa Springs.

VAR. *NUDICAULE* (Torr.) Reveal, comb. nov., based on *E. effusum* Nutt. var. *nudicaule* Torr., Explor. & Surv. Railroad Route from Mississippi River to Pacific Ocean 4: 132. 1857. [*E. n.* (Torr.) Small.] Erect herbs 2--3 dm high, 1--2 dm across; leaves basal or sheathing up the stem less than 2 cm, the leaf-blades linear to linear-lanceolate, 3--5 (7) cm long, 2--4 mm wide; inflorescences cymose, 5--12 cm long, divided 1--3 times; involucre 2--3 mm long; flowers white. -- Local and rather rare on clay hills and flats in Sandoval and Santa Fe cos., N.M. Aug-Sep.

In Stokes' (1936) monograph of the genus, she failed to understand the nature of the type of *E. effusum* var. *nudicaule* in that she associated several discordant elements with the species name, *E. nudicaule*. Although she recognized the general similarities of the species to *E. scoparium* and *E. tristichum*, both synonyms of var. *lonchophyllum*, she also associated forms of *E. brevicaulis* with the species, naming *E. brevicaulis* var. *brevicaule* and var. *laxifolium* (Torr. & Gray) Reveal, and a second species, *E. spathulatum* A. Gray. She retained *E. lonchophyllum* as a valid species, but referred *E. salicinum* to *E. effusum*, and *E. sarothrifolium* to what I have called *E. corymbosum*.

The new variety of *Eriogonum lonchophyllum* differs from var. *lonchophyllum* mainly in its open, erect habit that is decidedly not shrublike, the nearly basal leaves, and less branched inflorescences.

20. *E. LACHNOGYNUM* Torr. ex Benth. in DC. [*E. tetraeuris* Small. *E. l.* ssp. *t.* (Small) S. Stokes.] Erect herbaceous perennials 1--3.5 dm high, 1--2 dm across; leaves lanceolate to narrowly elliptic, 1--2.5 (3) cm long, 3--5 (8) mm wide, white- or silvery-tomentose on both surfaces or sometimes somewhat less so above, the petiole 0.5--2.5 (3) cm long; stems erect, 1--2 dm long, floccose; inflorescences subcapitate to cymose, floccose; peduncles erect, 2--15 mm long, floccose; involucre broadly campanulate, 3--4 mm long, 3--6 mm wide, floccose without, the 5

broadly acute to obtuse teeth 1--1.5 mm long; flowers yellow under the dense, white pubescent without, 2.5--5 (6) mm long, the tepals lanceolate; achenes brown, 3--4 mm long, villous throughout. -- Local and rare to infrequent on limestone outcrops, flats, and gypsum slopes from s. Colo. and sw. Kans. s. to n. Tex., n. N.M., and nw. Ariz.; usually but not always associated with gypsum soils from Apache Co., Ariz., and across the n. third of N.M. Jul-Oct.

21. E. HAVARDII S. Wats. [*E. leucophyllum* Wooton & Standley]
Erect herbaceous perennials (2) 3--6 dm high, 1.5--4 dm across; leaves oblanceolate to elliptic, 1--3 (5) cm long, 2--10 (13) mm wide, white- or silvery-tomentose on both surfaces, the petiole 5--15 (25) mm long; stems erect, 5--25 cm long, glabrous; inflorescences cymose, 1--4 dm long, glabrous; peduncles erect, 0.5--6 cm long, glabrous; involucre campanulate, 1.5--2.5 mm long, (1.5) 2--3 mm wide, glabrous, the 5 acute teeth 0.5--0.8 mm long; flowers yellow under the dense white pubescence, 2.5--3 mm long, the tepals lanceolate; achenes brown, 2--2.5 mm long, glabrous. -- Local and usually rare or at least infrequent on gravelly to rock limestone outcrops in se. N.M. and w. Tex.; Socorro, Lincoln, and Chaves cos. s. to the Tex. line. May-Sep.

This tall, graceful species is frequently not seen even when in flower due to the slender stems and branches, and the basal leaves. The species is unique in the New Mexico flora and cannot be confused. The type of *Eriogonum leucophyllum* described by Wooton and Standley (1913) has no real bases, and Stokes (1936) totally misunderstood the nature of the type (see *E. hieracifolium*).

22. E. WRIGHTII Torr. ex Benth. in DC. Low spreading highly branches subshrubs or shrubs 1.5--15 dm high, 1--15 dm across; leaves sheathing, the leaf-blades linear to oblanceolate or elliptic to broadly elliptic, (0.3) 0.5--3 cm long, 1--25 mm wide, tomentose on both surfaces or with the upper surface floccose to glabrous and green, the margin entire or crenulate, plane to revolute, the petiole 0.2--5 (6) mm long; stems slender to stout, 5--40 (60) cm long, lanate to glabrous; inflorescences virgate to \pm cymose or rarely capitate, the involucre usually racemously arranged along the tips (at least) of the branches, up to 4 dm long, lanate to glabrous; peduncles lacking; involucre turbinate to turbinate-campanulate, 1--4 mm long, 1--2.5 mm wide, lanate to glabrous, the 5 acute to rounded teeth 0.3--1 mm long; flowers white, becoming pink to rose, 1.5--4 mm long, glabrous, the tepals obovate to oblong-obovate; achenes light brown to brown, (1) 1.5--3 mm long. -- Widespread and highly variable from n. Calif. to central Baja Calif., e. across s. Nev. to n. Ariz., and se. across most of Ariz. and s. N.M. to w. Tex. s. into central Mex. Jul-Dec.

This species is highly variable, ranging from tiny caespitose mats atop the Sierra Nevada [var. *olanchense* (J. T. Howell) Reveal] to large desert shrubs such as var. *nodosum* (Small) Reveal. The Arizona and New Mexico plants belong to only two of the eleven varieties belong to the species.

VAR. WRIGHTII. [*E. w.* var. *floccosum* Benth. in DC. *E. helianthemifolium* Benth. in DC. *E. w.* var. *h.* (Benth. in DC.) Torr. in Emory. *E. trachygynum* Torr. ex Benth. in DC. ssp. *w.* (Benth. in DC.) S. Stokes. *E. t.* ssp. *glomerulum* S. Stokes. *E. w.* ssp. *g.* (S. Stokes) S. Stokes.] Low subshrubs 1.5--5 dm high, 1--5 dm across; leaves oblanceolate to elliptic, 0.5--1.5 cm long, 2--5 (7) mm wide, tomentose below, floccose above, the petiole up to 5 mm long; inflorescences slender to \pm stout, tomentose to floccose throughout; involucre turbinate, 2--2.5 mm long; flowers white, becoming pink to rose in some, 2.5--4.5 mm long; achenes 2.5--3 mm long. -- Common and widespread from e. Calif. e. across Ariz. and N.M. to w. Tex., and s. to central Mex.; common throughout all but the ne. quarter of N.M. July-Sep.

VAR. PRINGLEI (Coulter & Fisher) Reveal. [*E. p.* Coulter & Fisher. *E. trachygynum* Torr. ex Benth. in DC. ssp. *p.* (Coulter & Fisher) S. Stokes. *E. w.* ssp. *p.* (Coulter & Fisher) S. Stokes.] Spreading shrubs 3--7 dm high, 4--10 dm across; leaves broadly elliptic, 7--15 mm long, 2--5 mm wide, lanate on both surfaces, the petiole 1--3 mm long; inflorescences dense, stout, lanate; involucre turbinate-campanulate, 1--1.5 mm long; flowers white, becoming pink to rose, 1.5--1.8 mm long; achenes 1--1.5 mm long. -- Local and rare in s.-central and sw. Ariz., from Yuma, Pinal, and Pima cos. Aug-Nov.

I have not observed this taxon in the field, and I know little about its overall distribution other than it is rare and infrequently collected. It is possible, with field studies, this variant may well have to be proposed as endangered or threatened.

23. *E. RACEMOSUM* Nutt. [*E. orthocladon* Torr. in Sitgr. *E. obtusum* Benth. in DC. *E. r.* var. *sagittatum* Gandoger. *E. r.* var. *cordifolium* Gandoger. *E. r.* var. *orthocladon* (Torr. in Sitgr.) S. Stokes. *E. r.* var. *obtusum* (Benth. in DC.) S. Stokes.] Tall erect herbaceous perennials 3--8 (10) dm high; leaves elliptic to ovate or oval, (1.5) 2--6 (10) cm long, 1--2.5 (3.5) cm wide, lanate to tomentose below, floccose to glabrate or glabrous above, the petiole (2) 3--10 (15) cm long; stems erect, (1) 1.5--2.5 (3) dm long, tomentose to floccose; inflorescences cymosely branches with the virgated branches bearing 5--20 or more racemosely arranged involucre, 1.5--5 dm long, divided (2) 3--7 (10) times, tomentose to floccose; peduncles, when present, erect and up to 4 cm long, tomentose to floccose; involucre turbinate-campanulate, (2) 3--5 mm long, (2) 2.5--4 mm wide, tomentose to floccose without, the 5 acute teeth 0.1--0.5 mm long; flowers white to greenish- or brownish-white with greenish or reddish midribs and bases, often becoming pink to rose in fruit, (2) 2.5--5 mm long, glabrous, the tepals oblong-oblanceolate; achenes light brown, 3--4 mm long. -- Common and widespread from central Nev. e. across Utah to s. Colo, n. Ariz., and n. N.M.; usually on the forest floor or on sagebrush flats from Mohave Co. e. to Apache Co. and s. to Gila Co., Ariz., and from San Juan Co. e. to Colfax Co., and s. to Catron Co., N.M.

None of the variants recognized in this species is particularly distinct, and the continued attempt to recognize leaf-shape determined varieties is unnecessary.

24. *E. ZIONIS* J. T. Howell var. *COCCINEUM* J. T. Howell. Erect herbaceous perennials 3--5 dm high; leaves oblong-ovate to ovate, 2--4.5 cm long, 1.5--2.5 (3) cm wide, lanate to tomentose below, thinly floccose to glabrous above, the petiole 3--6 (8) cm long; stems erect, 1--2.5 dm long, slender or slightly fistulose, glabrous and grayish-green; inflorescences narrow, cymosely branched with the virgated branches containing 8--15 racemously arranged involucre, 2--3.5 dm long, divided 2--5 times, glabrous; involucre turbinate to turbinate-campanulate, 1.5--3 mm long, 1.5--2.5 mm wide, tomentose without, the 5 rounded teeth 0.2--0.4 mm long; flowers brilliant red or scarlet, 2.5--3.5 (4) mm long, glabrous, the tepals oblong; achenes light brown, 3--4 mm long. -- Local and exceedingly rare, known from only a few individuals at Point Sublime (n. rim of the Grand Canyon) and at the head of Bass Trail at Bass Camp (s. rim of the Grand Canyon), Coconino Co., Ariz. Aug-Sep.

This is one of Arizona's most endangered taxa. On the South Rim, about 15 individuals were known in 1939 when the last census (to my knowledge) was taken. At Point Sublime, I discovered the real population of var. *coccineum* as short distance to the northwest of where the type collection was made (Howell 1943). Here there were more than 50 individuals all within an area of less than an acre. Although this taxon occurs within a national park, the heavy recreational use of Grand Canyon National Park does not readily lend itself for a prior protection of such a rare plant.

I reported in my review of the Utah buckwheats (Reveal 1973) that var. *zionis* may have been collected near Flagstaff. The basis of that report is *Mishler 1215*, along Lake Mary, 11 Jul 1967 (ASU, BRY). I have been unable to visit this area and investigate the population, but I tend to think that this may be a rare, glabrous individual of *E. racemosum*.

25. *E. SHOCKLEYI* S. Wats. var. *LONGILOBUM* (M. E. Jones) Reveal. [*E. l. M. E. Jones. E. acaule* Nutt. var. *l.* (M. E. Jones) M. E. Jones. *E. s. ssp. l.* (M. E. Jones) S. Stokes.] Low pulvinate herbaceous perennials forming flat to rounded mats (1) 2--4 dm across; leaves oblanceolate to spatulate, (3) 5--8 (12) mm long, (2) 3--6 mm wide, tomentose below, often slightly less so above, the petiole 2--5 mm long; stems scapose, up to 3 cm long, tomentose, erect or nearly so; inflorescences capitate; involucre congested, campanulate, (3) 4--6 mm long, floccose to tomentose without, the 5--10 lanceolate lobes (1) 2--3 mm long; flowers white with reddish to rustic midribs and bases, becoming rose to rustic in age, 3--4 mm long, the tepals oblong to obovate; achenes light brown to brown, 2.5--3 mm long, usually densely pubescent. -- Clay hills and flats or infrequently on sandstone ledges and outcrops from (as a species) e. Calif. e. to s. Ida., w. Colo. and nw. N.M.;

extreme e. Mohave Co. e. across the n. tier of cos. in Ariz. to San Juan Co., N.M. May-Jul (Sep).

This species is composed of two additional variants, one of which from southwestern Idaho is still undescribed. The typical variety occurs from eastern California across most of Nevada to western Utah and southern (mainly eastern) Idaho. The var. *long-lobum*, on the other hand, occurs from eastern Utah and adjacent western Colorado southward to Arizona and New Mexico.

26. E. OVALIFOLIUM Nutt. Low matted pulvinate to cespitose herbaceous perennials forming mats (0.5) 1--4 dm across; leaves oblanceolate to elliptic or spatulate, oblong to obovate or oval to rounded, 0.2--6 cm long, (1) 2--15 mm wide, tomentose on both surfaces or somewhat less so above, the petiole up to 1 dm long; stems scapose, 0.3--30 cm long, lanate to floccose; inflorescences capitate; involucre solitary or congested (ours), turbinate to turbinate-campanulate, (2) 3.5--5 (6.5) mm long, 2--4 mm wide, tomentose to floccose without, the 5 acute to rounded teeth up to 1 mm long; flowers white, cream or brownish maturing pinkish, rose, red, or purple, or yellowish to yellow, (2.5) 3--6 (7) mm long, glabrous, the tepals dimorphic, those of the outer whorl oval to orbicular, those of the inner whorl lanceolate to elliptic and somewhat longer; achenes light brown to brown, 2--3 mm long. -- Widespread and common throughout much of the western United States and southern Canada; Mohave Co. e. across the n. tier of cos. in Ariz. to San Juan Co., N.M. Apr-Jul.

This species is exceedingly complex and difficult due to the numerous minor, and major, morphological variations which have received formal taxonomic recognition. McDougall (1973) proposed to treat the white-flowered phase of the species, as it occurs in the two states being considered here, as ssp. *vimeum* (Small) S. Stokes. However, as we (Reveal & Munz 1968) have shown previously, the var. *vimeum* (Small) A. Nels. is restricted to a few limestone outcrops in the San Bernardino Mountains in California (where it is now seriously endangered). Munz and Keck (1959) termed the white-flowered form in California ssp. *eximium* (Tidestrom) S. Stokes, but this name was later placed in synonymy under var. *nivale* (Canby) M. E. Jones (Reveal & Munz 1968). Recently, Howell (1976) has proposed to restrict var. *eximium* (Tidestrom) J. T. Howell to the Carson Range in western Nevada and adjacent California, and differentiated it from var. *nivale* on the basis of involucre and flower size, and from var. *ovalifolium* on scape length and the degree of division of the involucre teeth. The var. *eximium* is a low elevation form of var. *nivale*, and little more.

The yellow-flowered form of the species has been called a series of names, but the oldest available variatal name in var. *multiscapum* Gandoger. I have not seen this variant from Arizona, but McDougall (1973) claims the yellow-flowered phase to be present. The above description applies to all forms of the species, and below I shall present a series of distinction to separate var. *ovalifolium* from var. *multiscapum*, although the distribution of the

latter cannot be given.

VAR. OVALIFOLIUM. [*Eucycla o.* (Nutt.) Nutt. *Eucycla purpurea* Nutt. *Eriogonum p.* (Nutt.) Benth. in DC. *Eriogonum o.* var. *p.* (Nutt.) Durand. *Eriogonum o.* ssp. *p.* (Nutt.) S. Stokes.] Mats 2.5--4 dm across; leaves mostly obovate to oval or rounded, 0.5--2 cm long, the petiole (3) 5--15 mm long; flowers white to cream or brownish, maturing pinkish to rose or purplish, 4--5 mm long. -- Common throughout the w. United States and sw. Canada; across the n. tier of cos. in Ariz. and into San Juan Co., N.M. Apr-Jul.

VAR. MULTISCAPUM Gandoger. [*E. orthocaulon* Small. *E. ovalifolium* var. *celsum* A. Nels. *E. ovalifolium* var. *orthocaulon* (Small) C. L. Hitchc.] Mats 2--4 dm across; leaves elliptic to spatulate or oblong, 3--6 cm long, the petiole 3--8 (10) cm long; flowers pale-yellow to yellow, 4--7 mm long. -- Rather common from sw. Wyo. and w. Colo. across n. Utah and Nev. to e. Calif., and in s. Ida. and se. Ore.; reportedly in n. Ariz. according to McDougall (1973), but no specimens seen by this writer. Apr-Jun.

SUBGENUS MICRANTHA (BENTH.) REVEAL

27. **E. ANNUUM** Nutt. [*E. lindheimerianum* Scheele. *E. simpsonii* Benth. in DC. var. *floccoso-lanatum* Benth. in DC. *E. cymosum* Benth. *E. a.* ssp. *c.* (Benth. in DC.) S. Stokes. *E. a.* ssp. *chihuahuense* S. Stokes.] Tall leafy biennial or infrequently late-flowering annual herbs 0.5--2 m high; leaves oblong to oblanceolate, 1--7 cm long, 3--15 mm wide, tomentose below, floccose above, the petiole mostly less than 5 mm long; stems erect, 0.4--1 m long, leafy, floccose to tomentose; inflorescences mostly cymose and open, up to 1 m long but mostly (1) 2--7 dm long, floccose to tomentose; peduncles, when present, erect, up to 5 mm long, mostly tomentose; involucre turbate to campanulate, 2.5--4 mm long, 2--3 mm wide, floccose to tomentose without, the 5 acute to triangular teeth 0.4--1 mm long; flowers white to pink maturing rose to red-brown, 1--2.5 mm long, glabrous without, pubescent and glandular within, the tepals dimorphic, those of the outer whorl obovate, those of the inner whorl narrowly ovate to oblong; achenes brown, 1.5--2 mm long or sometimes becoming tangled in the pubescence of the flower and seemingly pubescent. -- Great Plains of the United States s. to ne. Mex.; widespread and rather common in the e. half of N.M. from Rio Arriba and Balencia cos. s. to Dona Ana Co., and then e. (Apr) Jun-Sep (Nov).

This species is the only member of the genus that is a tall, densely tomentose, leafy plant with the exception of *Eriogonum polycladon* Benth. in DC. The latter has very small flowers that are glabrous, usually solitary leaves (not in fascicles as in *E. annuum*), and a much branched, elongated inflorescence of racemously arranged involucre. The related *E. multiflorum* Benth. may eventually be found in New Mexico (see Reveal 1970).

SUBGENUS OLIGOGONUM NUTT.

28. *E. UMBELLATUM* Torr. Low caespitose to pulvinate herbaceous perennials to erect or spreading subshrubs or shrubs up to 1 m high and across, the mats, when formed, up to 8 dm across; leaves oblong, elliptic, oval, spatulate, broadly obovate to suborbicular, 0.4--3 cm long and wide, densely lanate to tomentose or glabrous on both surfaces, or more frequently tomentose below and subglabrous to glabrous and green above, the petiole 0.2--10 mm long; stems slender to stout, (3) 5--30 cm long, bractless about mid-length, mostly tomentose to glabrous; inflorescences simple to compound umbels or reduced and subcapitate to capitate, the rays usually floccose to glabrous, up to 7 mm long; involucre turbinate to campanulate, the tube 1--6 mm long, (1) 1.5--10 mm wide, thinly tomentose to slightly floccose or glabrous without, the (5) 6--10 (12) linear-lanceolate to oblong lobes 1--6 mm long, usually reflexed; flowers cream to yellow, variable in coloration, 2.5--10 mm long including the (0.7) 1.3--2 mm long stipe, glabrous, the tepals slightly dimorphic, mainly spatulate to obovate; achenes light brown to brown, 2--5 mm long, sparsely pubescent at the apex. -- Widespread and common throughout most of the w. United States and sw. Can. May-Oct.

This species is highly variable and composed of more than 20 distinct variants. The species reaches its southernmost range in Arizona and New Mexico, and thus only a few members of the species are encountered here.

VAR. *UMBELLATUM*. Low mat-forming perennials up to 6 dm across; leaves tomentose below, glabrous to floccose (or rarely tomentose) above; stems up to 3 dm long; inflorescences umbellate and simple, not branched; flowers bright yellow, 4--7 mm long. -- Wash. e. to Mont. s. to central Oreg., n. Nev., nw. Ariz., and s. Colo.; known in our area only from a single collection (*Holmgren 3292*) from Wolf Hole Mtn., Mohave Co., Ariz., but to be expected in the mts. of n. N.M. Jun-Sep.

VAR. *SUBARIDUM* S. Stokes. [*E. biumbellatum* Rydb. *E. ferrissii* A. Nels. *E. u.* ssp. f. (A. Nels.) S. Stokes. *E. u.* ssp. s. (S. Stokes) Munz.] Erect to suberect subshrubby to shrubby perennials up to 6 dm across and 1 m high; leaves thinly floccose to glabrous on both surfaces; stems 0.5--2 dm long; inflorescences compoundly branched into two or more umbellate segments; flowers bright yellow or rarely cream-colored, 6--7 mm long. -- Restricted to the desert ranges from se. Calif. e. across s. Nev. to s. Utah, n. Ariz., and sw. Colo.; from Mohave Co. e. to nw. Navajo Co., Ariz. Jul-Oct.

McDougall (1973) includes within his description of *Eriogonum umbellatum* some features of var. *subaridum*, but aside from the length of the flowers and the distribution given, the description is based almost entirely upon var. *cognatum*. He implies, by the distribution listed, that what I am calling var. *subaridum* would be in

Apache Co., and while I have seen no specimens from this area, its presence would not be surprising (Reveal 1968d); I would also suspect the variant to be found in San Juan Co., New Mexico, as well. In Kearney and Peebles (1951), this plant was called simply *E. umbellatum*, but the type of *E. ferrissii* was referred to *E. cognatum*.

VAR. COGNATUM (Greene) Reveal. [*E. c.* Greene.] Low perennials to 3 (4) dm across; leaves densely white-tomentose below, thinly pubescent or more commonly glabrous and bright green above; stems erect, slender, 1--1.5 dm long, glabrous; inflorescences compoundly umbellate into several segments; flowers bright yellow, 4--6 mm long. -- Locally common in s.-central Coconino Co. s. to extreme ne. Yavapai and nw. Gila cos., Ariz. Jul-Sep.

The best distinction between var. *cognatum* and var. *subaridum* which can be noted in herbarium material is in the shape of the leaves. In the former, the leaves are oblong-obovate to broadly elliptic, while in the latter they are much narrower. In my note on this variant (Reveal 1968d), I pointed out the strongly isolated nature of var. *cognatum*, and concentrated field work in northern Arizona since then has done nothing to close the geographical gap between this taxon and the remaining members of the species.

29. *E. CAESPITOSUM* Nutt. [*E. andinum* Nutt.] Low pulvinate to caespitose herbaceous perennials forming mats up to 4 dm across; leaves elliptic to obovate or oblong-spatulate to nearly oval, 2--10 (15) mm long, 1.5--4 (5) mm wide, tomentose on both surfaces to slightly less so to floccose above, the petiole 0.5--4 mm long; stems scapose, ± erect, (1) 3--8 (10) cm long, usually floccose to glabrous, without a whorl of bracts even at the base of the involucre; inflorescences capitate; involucre campanulate, the tube 2--3.5 mm long, 3--5 mm wide, tomentose to floccose without, the 6--9 reflexed lobes 2--3.5 mm long; flowers yellow, becoming tinged with red or reddish with age, 2.5--10 mm long including the 0.5--1 mm long stipe, pilose to villous without, the tepals ± oblong to oblanceolate; achenes light brown to brown, (3.5) 4--5 mm long, with a glabrous to slightly pubescent beak. -- Widespread and locally infrequent to common from e. Calif. and Ore. e. to w. Mont., w. Wyo., and nw. Colo. s. to s. Utah and nw. Ariz.; known only from Beaver Dam Mtn., Mohave Co. Ariz. Apr-Jun.

Although this plant was collected by Barkley (3360, MONTU, WTU) in 1932, the species has not been reported from Arizona by either Kearney and Peebles (1951) nor McDougall (1973). It is obviously rare in the area as Higgins (1967) does not report the species from the Beaver Dam Mountains in Utah.

30. *E. JAMESII* Benth. in DC. Low matted to robust and erect herbaceous perennials up to 4.5 dm high and 6 dm across; leaves oblanceolate to elliptic, (0.5) 1--5 cm long, 0.5--2.5 cm wide, tomentose below, floccose above or becoming thinly pubescent to glabrous and greenish above in some, the petiole 0.5--6 cm long; stems erect, slender to stoutish, (3) 5--20 (25) cm long, tomentose to

floccose; inflorescences usually open, simple or compoundly umbellate, rarely highly reduced and capitate (as on the Kaibab Plateau, Ariz.), up to 3 dm long, tomentose to floccose; involucre turbinate to campanulate, 3--7 mm long, 2.5--8 mm wide, tomentose to floccose without, the 5--8 erect teeth up to 0.5 mm long; flowers white to cream or yellow with greenish to dark yellow midribs and bases, becoming tinged with pink in some at maturity, 3--9 mm long including the 0.7--2 mm long stipe, densely pubescent without especially along the midribs and bases, the tepals dimorphic, those of the outer whorl lanceolate, those of the inner whorl narrower and longer; achenes light brown to brown, 4--5 mm long, with a sparsely pubescent beak. -- Rather common and often locally abundant from e. Utah, Colo. and se. Wyo. s. to Ariz., N.M., w. Kans., w. and n. Tex., and ne. Mex.; common throughout much of both states but in particular n. and e. Ariz., and e. and s. N.M. Jun-Oct.

As I have become more and more familiar with *Eriogonum jamesii* the more I have come to discover that it is an exceedingly complex taxon with numerous local and region modifications in its gross external morphology. In the past I have tended to ignore the significance of many of these local populations, while in the related *E. umbellatum*, I (and others) have tended to recognize them. It is now becoming clear that *E. jamesii* is as difficult to treat as *E. umbellatum*. I have tried to maintain a uniform understanding of *E. umbellatum*, acknowledging that small, local populations are often very distinct (especially to the local flora expert), but when considered on the whole, none can be maintained at the species rank. Thus, Colorado workers (Weber, 1972) have kept *E. umbellatum* var. *majus* Hook. a distinct species (calling it *E. subalpinum* Greene), and Howell (1973, 1976) has proposed var. *torreyanum* (Gray in Torr. & Gray) M. E. Jones be considered as a distinct species. This does not take into account, for example, that in Wyoming, western Montana, and Idaho, var. *majus* intergrades with var. *dichrocephalum* Gandoger, nor that in extreme northern California and adjacent Oregon there is var. *glaberrimum* (Gandoger) Reveal which is as distinct from var. *umbellatum* as var. *torreyanum*, but together, are very close to one another.

The situation within *Eriogonum jamesii* is nearly as complex, but fortunately, with far few taxa than in *E. umbellatum*. However, unlike the latter species, associated with the former are a series of closely related species which are seemingly weakly distinct on biological grounds, but morphologically and distributionally, seem to be as sound a species as any in the genus. *Eriogonum correllii* Reveal of northern Texas, and *E. allenii* S. Wats. in Coult. & Wats. of the Virginias are highly isolated, but are still very closely related to *E. jamesii* var. *wootonii* Reveal of south-central New Mexico. Field studies have shown that in southeastern Wyoming and in extreme north-central Colorado, *E. jamesii* and *E. flavum* Nutt. in Fras. intergrade to such a degree that in the mountains east of Laramie, Wyoming, the two can often be exceedingly difficult to separate. This is one of the few cases in the genus where two related species intergrade; most hybridization is between unrelated

groups of species (*E. brevicaulis* x *E. corymbosum*; *E. batemanii* x *E. shockleyi*; *E. brevicaulis* x *E. microthecum*). While reviewing this situation in the field, I finally realized that a form of *E. flavum* in the Colorado Rocky Mountains, var. *xanthum* (Small) S. Stokes, was in fact not a form of *E. flavum*, but should be called *E. jamesii* var. *xanthum*.³

Finally, discussion with Steve Stephens and Ronald McGregor of the University of Kansas, coupled with my own field work in southwestern Kansas, have proved to me that the isolated Kansas populations deserve special recognition as proposed by Gandoger (1906), and thus *Eriogonum jamesii* var. *simplex* Gandoger is maintained for these plants.

VAR. FLAVESCENS S. Wats. [*E. arcuatum* Greene. *E. bakeri* Greene. *E. vegetius* A. Nels. *E. j.* ssp. *f.* (S. Wats.) S. Stokes. *E. j.* var. *a.* (Greene) S. Stokes. *E. j.* ssp. *b.* (Greene) S. Stokes.] Mats up to 5 dm across; leaves oblanceolate to elliptic, 1--3 cm long, 0.5--1.5 cm wide, the margin entire; inflorescences divided 1--3 times, up to 2 dm long, rarely capitate or umbellate as in northern Arizona; bracts mostly narrowly elliptic, up to 2 cm long and 1 cm wide; involucre 3--7 mm long, 4--8 mm wide; flowers yellow, (4) 5--8 mm long. -- Common and rather widespread from e. and s. Utah e. to s. and central Colo. as far n. as se. Wyo., and s. to n. Ariz and N.M.; local and often common from Mohave Co. e. across the n. tier of cos. (and Yavapai Co.) to nw. N.M. (as far e. as Sandoval Co.). Jul-Sep.

The attempts to maintain either *Eriogonum arcuatum* or *E. bakeri* as distinct from *E. jamesii* simply do not take into account the variation within *E. jamesii*. The only major difference between vars. *flavescens*, *rupricola* Reveal (of southwestern Utah), *wootonii*, and the forms more closely related to var. *jamesii* such as vars. *simplex* and *undulatum* is the flower color. Again this is an impressive difference to the local taxonomist, but not so when the entire range of the species is considered, and when one remembers that in such species as *E. umbellatum* and *E. compositum* Dougl. ex Benth. in Lindl. both color phases are common.

VAR. WOOTONII Reveal. Mats up to 5 dm across; leaves broadly elliptic, 3--5 cm long, 1.5--3 cm wide, the margin entire; inflorescences divided 3--5 times, up to 2 dm long; bracts mostly foliaceous, those of the first node narrowly elliptic, 2--4 cm long, 0.7--1.8 cm wide; involucre 3--6 mm long, 4--9 mm wide; flowers yellow, 4--7 (9) mm long. -- Local and often common in the mts. of s.-central N.M. in Lincoln and Otero cos. Jul-Sep (Oct).

This New Mexico phase was described in my 1973 paper on the buckwheats of Utah. It has been variously called *E. jamesii* or *E. bakeri*.

³ *Eriogonum jamesii* Benth. in DC. var. *xanthum* (Small) Reveal, comb. nov., based on *E. xanthum* Small, Bull. Torrey Bot. Club 33: 51. 1906.

VAR. JAMESII. [*E. j.* var. *neomexicanum* Gandoger.] Mats up to 8 dm across; leaves mostly narrowly elliptic, 1--3 cm long, 0.5--1 cm wide, the margin entire; inflorescences divided 1--6 times, up 3 dm long; bracts mostly narrowly elliptic, up to 2 cm long and 1 cm wide; involucre 4--7 mm long, 2--5 mm wide; flowers white to cream, 4--8 mm long. -- Widespread and often common from n.-central Colo. s. throughout the e. half of Ariz. e. to n. and w. Tex.; from Coconino Co. s. to Gila and Graham cos., Ariz., and throughout most of N.M. Jun-Sep.

VAR. UNDULATUM (Benth. in DC.) Stokes ex Jones. [*E. u.* Benth. in DC. *E. j.* ssp. *u.* (Benth. in DC.) S. Stokes.] Mats up to 8 dm across; leaves mostly narrowly elliptic, 1--2 cm long, 0.5--1 cm wide, the margin crisped and usually undulate; inflorescences divided 3--6 times, up to 1.5 dm long; bracts narrowly elliptic, up to 1.5 cm long and 0.6 cm wide; involucre 1.5--4 mm long, 2--3 mm wide; flowers white to cream, 3--5 mm long. -- Widespread and often locally common from se. Ariz. and sw. Tex. s. to n. Mex.; currently known only from Ariz. in Cochise, Santa Cruz, Santa Rita and perhaps Gila cos., but to be expected in the mountains of s. N.M. Jul-Sep.

The distinction between var. *jamesii* and var. *undulatum* is a subtle one at best. The northern var. *jamesii* gradually grades into var. *undulatum* in an irregular line from Jeff Davis and Brewster cos., Texas, through the mountain ranges of extreme northern Coahuila and Chihuahua, Mexico, and in southeastern Arizona. The main difference is in the texture of the leaf margin, with that of var. *jamesii* being entire and smooth while that of var. *undulatum* is crisped and wavy or undulate. This broad band of contact caused Johnston (1944) to reject var. *undulatum* as a distinct taxon.

For the most part, var. *jamesii* is a foothill taxon, occurring mainly in the foothills and lower slopes and flats of the Rocky Mountains or desert ranges of Arizona, New Mexico, and Texas. The var. *undulatum* is entirely a montane taxon, usually found well up on the slopes, and at least in Mexico, on the highest ridges.

SUBGENUS PTEROGONUM (H. GROSS) REVEAL

31. *E. HIERACIFOLIUM* Benth. in DC. [*Pterogonum h.* (Benth. in DC.) H. Gross. *E. pannosum* Wooton & Standley. *E. leucophyllum* Wooton & Standley ssp. *p.* (Wooton & Standley) S. Stokes.] Erect herbaceous perennials 4--7 dm tall; leaves basal and cauline, the leaf-blades oblanceolate to spatulate, 3--15 cm long, 0.5--2 cm wide, sparsely to densely strigose, the petiole 0.5--5 cm long, the cauline leaf-blades oblanceolate, 0.5--5 cm long, sessile; stems erect, 3.5--6.5 dm long, strigose; inflorescences open paniculated cymes, 4--15 (18) cm long, strigose; involucre turbinate-campanulate to campanulate, 2.5--4 mm long, 2.5--5 mm wide, hirsute to strigose without, the 5 triangular teeth 0.5--1.5 mm long; flo-

wers yellow, 1.5--2.5 mm long in anthesis, 3--5 mm long and reddish in fruit, strigose without, the tepals + ovate; achenes yellowish-green maturing light brown, 4.5--6 mm long, strigose at the apices along the winged margins on the upper half of the fruit. -- Local and infrequent to common mainly in gravelly soil from e. Ariz. se. across the s. half of N.M. to w. Tex. and n. Chihuahua, Mex.; from Navajo, Apache and Gila cos., Ariz. se. across the s. half of N.M. from Bernalillo Co. s. Jul-Oct

This species can be quickly distinguished from the next by the strigose flowers and the achene which is winged only near the apex. This subgenus has been studied extensively by William J. Hess and myself (Hess & Reveal in press) and our findings will be published shortly.

I cannot explain the actions of Wootton and Standley (1913) in proposing *Eriogonum pannosum*, as it falls well within the definition of *E. hieracifolium*. Both types were collected within a few miles of each other in southeastern New Mexico. However, what is even more impossible to understand is Miss Stokes' attempt to associate *E. pannosum*, a member of the subgenus *Pterogonum*, with *E. leucophyllum*, a member of the subgenus *Eucycla*. Both Hess and I have reviewed her comments for a hint of reason, but can find none except that both grow in approximately the same part of New Mexico.

32. *E. ALATUM* Torr. in Sitgr. Tall erect monocarpic perennials 5--20 dm tall arising from deep soft woody, chambered taproots; leaves basal and cauline, the basal leaf-blades linear-lanceolate to lanceolate, oblanceolate or spatulate, (3) 5--20 cm long, 0.3--2 cm wide, strigose below, becoming glabrous on both surfaces except for the margins and veins, the petiole 2--6 cm long, the cauline leaf-blades linear-lanceolate to lanceolate, 1--9 cm long, + sessile; stems erect, 2--13 dm long, strigose to nearly glabrous at least below; inflorescences open paniculated cymes, 2--10 dm long, sparsely strigose to glabrous; peduncles erect, slender, 0.5--3.5 cm long, sparsely strigose to glabrous; involucre turbinate to campanulate, 2--4 (4.5) mm long and wide, strigose to glabrous without, the 5 acute to triangular teeth 1--1.8 mm long; flowers yellow to yellowish-green, 1.5--2.5 mm long in anthesis, becoming 3--6 mm long in fruit and often maturing reddish, glabrous without, the tepals lanceolate; achenes yellowish- to greenish-brown, maturing reddish-brown, 5--9 mm long, glabrous, distinctly winged the entire length of the fruit. -- Local and often common from e. Utah, se. Wyo. and w. Neb. s. into n. and e. Ariz., w. Kans. and Okla., n. and w. Tex., N.M., and extreme nw. Chihuahua, Mex.; common throughout n. and e. Ariz. and nearly all of N.M. Jun-Oct.

All three variants of this species occur within the two states of this paper. One, var. *glabriusculum*, just barely enters the area in northeastern New Mexico, while a second, var. *mogollense*, is wholly confined to north-central Arizona. The most widespread and common form of the species in this area is the typical variant which is common in both states.

KEY TO THE VARIETIES

- A. Flowering stems and inflorescences strigose, or if the inflorescence glabrous, then the plants of northern Arizona; leaves linear-lanceolate to oblanceolate or spatulate; widespread and common.
- B. Basal leaves linear-lanceolate to lanceolate or oblanceolate, 0.3--1.5 cm wide, the petiole-bases sparsely strigose to strigose; common var. *alatum*
- BB. Basal leaves spatulate, 1--2 cm wide, the petiole-bases densely strigose; Coconino and Navajo cos., Arizona var. *mogollense*
- AA. Flowering stems and inflorescences glabrous or only slightly strigose when young; leaves linear-lanceolate; Curry Co., New Mexico var. *glabriusculum*

VAR. ALATUM. [*E. triste* S. Wats. *E. a.* ssp. *t.* (S. Wats.) S. Stokes.] Plants 5--15 (17) dm high; leaves with sparsely strigose petiole-bases, lanceolate to oblanceolate; inflorescences thinly strigose, infrequently glabrous. -- Widespread and common throughout the range of the species except for n. Tex. and w. Okla.; common throughout most of the two states except in sw. Ariz. Jun-Oct.

In portions of northern Arizona, an occasional individual of var. *alatum* will be found in late anthesis or in fruit which will have glabrous stems and inflorescence branches. Such plants are usually, but not always, mixed with thinly strigose plants. The distinction of such glabrous individuals hardly seems logical, and *Eriogonum triste* is reduced to synonymy.

VAR. MOGOLLENSE Stokes ex Jones. [*E. a.* var. *macdougalii* Gandoger. *E. a.* ssp. *m.* (Stokes ex Jones) S. Stokes.] Plants 8--13 dm high; leaves with densely strigose petiole-bases, spatulate; inflorescences strigose. -- Local and usually common on the Mogollon Rim of central Coconino Co. e. to Navajo Co., Ariz. Jun-Sep (Oct).

The distinction between var. *alatum* and var. *mogollense* is not a sharp one, and scattered populations of var. *alatum* within the range of var. *mogollense* are not uncommon. In general, the Mogollon buckwheat has broader and shorter leaves which are densely strigose on the petiole-bases so that the basal portion of the plant at ground level is densely clothed with hairs. This phase grades into var. *alatum* to the north and east so that some populations in Navajo, Apache, and Gila cos., for example, can be difficult to place in either taxon. We (Hess & Reveal in press) have tried to restrict the distribution of var. *mogollense* to include only those plants of the pine forest area around Flagstaff, and southeastwardly along the edge of the Mogollon Rim to southern Navajo Co.

VAR. GLABRIUSCULUM Torr. in Sitgr. Plants 1--2 m high; leaves with sparsely strigose petiole-bases, lanceolate; inflorescences

glabrous. -- Local and infrequent to rare from Curry Co., N.M. e across n. Tex. to w. Okla. Jul-Oct.

This is the common form of the species in northern Texas and western Oklahoma. It just barely enters New Mexico where it occurs on limestone outcrops and thin, gravelly soil in open grasslands.

SUBGENUS GANYSMA (S. WATS.) GREENE

33. *E. ARIZONICUM* Stokes ex Jones. Erect, spreading herbaceous perennials 2.5--5 (6) dm high, forming loose mats 3--8 cm across; leaves basal but sheathing up the stems and exposed caudex branches 0.5--15 cm, the leaf-blades ovate to rounded, (0.5) 1--2 cm long and wide, densely white-pilose on both surfaces, the hairs becoming less densely matted at maturity, the margin entire and undulate-crispate, the base rounded to truncate, the petiole (0.5) 1--2.5 (4) cm long, pilose to nearly tomentose, the petiole-base strigose to pilose and brown without; stems erect, slender, 1--3 dm long, glabrous and glaucous; inflorescences narrowly cymose, erect, 1--3.5 (4) dm long, trichotomously branched at the first node, often with one or two additional branches or a single elongated peduncle, otherwise dichotomously branched throughout with a peduncle in the fork at each node, glabrous and glaucous; peduncles capillare to slender, erect, 0.5--2.5 cm long, glabrous and glaucous; involucre turbinate, (0.8) 1--2 mm long, (0.8) 1--1.5 mm wide, glabrous without, the 5 acute teeth 0.3--0.8 mm long; flowers yellowish to yellowish-red with a greenish or reddish to reddish-brown midrib and base, (1) 1.5--2 mm long in anthesis, becoming 2--3 mm long and pinkish to reddish in fruit, glabrous, the tepals slightly dimorphic, the outer tepals obovate with broadly expanded bases especially in fruit, the inner tepals obovate but without the broadly expanded bases; achenes dark brown, 1.5--2 mm long. -- Local and rare in widely scattered locations mainly on limestone soils in s. Gila, e. Maricopa, and extreme ne. Pinal cos. in se. Ariz., and near Rock Springs, Yavapai Co., and s. of Kingman, Mohave Co., Ariz. (Jun) Sep-Nov.

This beautiful perennial buckwheat has become so totally confused in the Arizona literature that its identity will take some fresh review. Kearney and Peebles (1951) placed the name in synonymy under *Eriogonum capillare* Small, a slender, delicate, late-fall flowering annual of southeastern Arizona. There key, however, fits *E. arizonicum* (although they thought the plants were possibly biennial). Shreve and Wiggins (1964) followed Kearney and Peebles and their description applies essentially to *E. arizonicum* and not *E. capillare*. In his unpublished doctoral dissertation of this part of the genus, Anderson (1959) recognized both species, but his descriptions for both fit equally well only *E. arizonicum*. I believe this will be the first time the exact identity of the two species will have been published.

The type of *Eriogonum arizonicum* was collected by Orcutt from an unknown location in the state of Arizona.

34. *E. INFLATUM* Torr. & Frém. Erect, first-year flowering perennials or strictly annuals (outside our area) 1--15 dm high; leaves oblong-ovate to oblong or rounded to reniform, (0.5) 1--2.5 (3) cm long, (0.5) 1--2 (2.5) cm wide, short-hirsute on both surfaces, infrequently less so to villous or glabrate above, the margin entire or crisped-undulate, the petiole 2--6 cm long; stems usually fistulose or inflated, sometimes slender, usually glabrous or merely pubescent at the base, (0.2) 1--4 dm long; inflorescences cymose, open, 0.5--5 dm long, 0.5--8 dm wide, the branches occasionally inflated, glabrous, with 3--5 branches at the first node; peduncles filiform to capillary, erect, 5--20 mm long, glabrous; involucre turbinate, 1--1.5 mm long, 1--1.8 mm wide, glabrous or with the teeth slightly glandular in some, 5-toothed; flowers yellow with reddish or greenish midribs and bases, (1) 2--2.5 (3) mm long, short-hirsute without, the tepals lance-ovoid to ovoid; achenes light brown to brown, 2--2.5 mm long. -- Widespread and common from e. and s. Calif. e. across Nev. and Utah to w. Colo. and then s. to s. Baja Calif. Sur and Sonora, Mex.; throughout most of Ariz. except the e. tier of cos. Mar-Oct (Dec).

VAR. *DEFLATUM* I. M. Johnston. [*E. glaucum* Small. *E. trichopes* Torr. ssp. g. (Small) S. Stokes.] Plants first-year flowering perennials 5--15 dm high; stems not inflated. -- Infrequent to locally common in s. Calif. and s. Ariz. s. to Sonora and Baja Calif. Sur, Mex.; mainly in the s. cos. of Ariz. Jul-Oct (Dec).

This variant is weakly defined in the northern part of its range in southern Arizona and California where it gradually grades into var. *inflatum*. For the most part the two can be distinguished on the degree (or lack of) stem inflation. Additionally, the var. *deflatum* is a more strictly erect plant than the typical form.

VAR. *INFLATUM*. [*E. clutei* Rydb.] Plants first-year flowering perennials (0.5) 2--10 dm high; stems inflated. -- Common and widespread from w. Colo. to e. Calif. and s. to n. Mex.; common and widespread in Ariz. except in the e. tier of cos., and becoming less frequent in the s. tier of cos. Mar-Oct.

The matter of *Eriogonum clutei* must once again be dealt with after the publication of the name by McDougall (1973) in spite of my personal comments to him on this taxon, and the publication on the status of this confused plant (Reveal 1968a). The type of this species is based on a basal rosette of *E. deflexum* while the inflorescence is *E. inflatum*. Rydberg (1921) did not detect this problem, and on the basis of the confused collection sent to him from Arizona, proposed the new species. In 1968, I lectotypified the name, *E. clutei*, on the inflorescence fragment of *E. inflatum* and the name is a synonym of that species.

As for var. *inflatum* itself, it is one of the more common species of the genus in Arizona, being found as far east as Graham Co. in the state. It is to be sought in southwestern New Mexico, as the next species, *E. trichopes*, occurs across the southern part of that state and apparently into the El Paso area of Texas.

35. *E. TRICHOPES* Torr. in Emory. [*E. trichopodum* Torr. ex Benth. *E. trichopodum* var. *minus* Benth. in DC. *E. trichopes* ssp. m. (Benth. in DC.) S. Stokes.] Erect herbaceous annuals 1--4.5 (6) dm high; leaves round-oblong to rounded, 1--2.5 (4) cm long, 1--2 (3) cm wide, hirsute, the margin entire or crenulate, the petiole 1--6 cm long; stems erect, slender, rarely fistulose, glabrous or only minutely hirsute at the base, 0.5--1.5 (2) dm long; inflorescences densely paniculated cymes, 0.5--4 dm long with numerous secondary branchlets at the lower (and especially the first node), glabrous; peduncles \pm erect, capillary, 5--15 mm long, glabrous; involucre turbinate, 0.7--1 mm long, 0.6--0.9 mm wide, glabrous without, 4-toothed; flowers yellowish to greenish-yellow, 1--2 (2.5) mm long, short-hirsute without, the tepals lance-ovate; achenes light brown to brown, 1.5--2 mm long. -- Widespread and often weedy from e. and s. Calif. e. to sw. Utah, w. and s. Ariz., s. N.M., extreme w. Tex., and n. Mex.; common and locally weedy in good years from Mohave Co. s. to Yuma Co. se. and e. across the s. tier of cos. in N.M. as far e. as Dona Ana Co. Mar-Jul (Dec).

This common, weedy species is occasionally confused with *Eriogonum inflatum*. In general, *E. trichopes* is a strict annual with numerous, fine branches in a dense inflorescences, and a 4-toothed involucre. Only in very young, healthy plants of *E. inflatum* is it nearly as bushy as *E. trichopes*, and then the stems are usually so grossly inflated, and the peduncles and lower branches so stout, that the two can still be distinguished even from a distance. In the latter regard too, from a distance, *E. trichopes* is a bright yellowish-green while the other species is a dull, grayish-green.

36. *E. TENELLUM* Torr. [*E. t.* var. *leptocladon* Benth. in DC.] Erect to spreading herbaceous perennials 1--5 dm high; leaves elliptic to ovate or orbicular, 3--15 mm long, 3--10 mm wide, densely tomentose on both surfaces, the petiole 4--20 mm long; stems slender to stoutish, 4--20 cm long, glabrous; inflorescences open, erect or spreading, 0.5--4 dm long, glabrous; peduncles slender, erect, straight, 0.5--6 cm long, glabrous; involucre turbinate, 2--4 mm long, 1.5--3 mm wide, glabrous without, tomentose within, 5-toothed; flowers white, 1.5--2.5 mm long in anthesis, becoming 2.5--3.5 mm long and pink or orange-brown or reddish in fruit, glabrous, the tepals dimorphic, those of the outer whorl ovate to obovate or sub-orbicular, the bases subcordate to cordate, 1.5--2 mm wide, those of the inner whorl narrowly oblong to oblong, 0.5--1 mm wide; achenes light brown to brown, 2--3 mm long. -- Widespread and usually locally common from se. Colo. and sw. Kans. s. through N.M. and Tex. to ne. Mex.; from Colfax Co. s. to Torrance and Lincoln cos. then se. to Eddy Co., N.M. Jun-Sep.

Our plants belong to the var. *tenellum*.

37. *E. PARISHII* S. Wats. Low spreading herbaceous annuals 1--3 dm high; leaves spatulate, 2--6 cm long, 0.5--2 cm wide, hirsute and green on both surfaces, the petiole 0.5--2.5 cm long, \pm winged; stems 3--10 cm long, glabrous except for the glandular

upper node; inflorescences hemispherical and forming dense masses 1--4 dm across, glabrous except for the glandular nodes; peduncles spreading, capillary, 4--12 mm long, glabrous or sparsely glandular; involucre turbinate, 0.5--0.9 mm long, glabrous without, 4-toothed; flowers red to pink, 0.5--0.7 mm long in anthesis, becoming 0.7--0.9 mm long and whitish with red midribs in fruit, minutely puberulent without, the tepals ovate; achenes dark brown, 1--1.3 mm long. -- Infrequent to locally common from s. Calif. and w. Ariz. s. to n. Baja Calif., Mex.; known only from Yavapai Co., Ariz. Jul-Oct.

In the 1969 edition of ARIZONA FLORA, Howell and McClintock (Kearney & Peebles 1969) reported the discovery of this species for the Arizona flora. I have seen no other collections except the Beaty collection they cited. Even so, McDougall (1973) fails to report the species from his area.

38. E. ORDII S. Wats. [*E. tenuissimum* Eastw.] Erect slender herbaceous annuals (0.5) 1--7 dm high; leaves basal and occasionally cauline, the basal leaf-blades oblong-oblongeolate or oblong-ovate to obovate, 2--8 cm long, 1--3 cm wide, thinly floccose to glabrous and green especially on the upper surface, the petiole 2--6 (10) cm long, the cauline leaf-blades restricted to the lower 1--3 nodes, elliptic to obovate, 0.7--3 cm long, 0.2--2 cm wide, otherwise similar to the lower leaves; stems erect, slender, (0.3) 0.7--3 dm long, loosely floccose near the base, glabrous above; inflorescences diffusely panicleate, + erect, (0.5) 1--5 dm long, glabrous except for scattered floccose hairs at the nodes and along the lower branches; peduncles erect, capillary, 5--20 mm long, glabrous or nearly so; involucre narrowly turbinate to turbinate, 1--1.5 (1.8) mm long, glabrous without, 4-toothed; flowers white to pale yellow, 1--1.5 mm long in anthesis, becoming 1.5--2.5 mm long and pink to red in fruit, short-villous, the tepals narrowly oblong to ovate; achenes dark brown to black, 1.8--2.1 mm long. -- Local and usually rare in widely scattered locations from nw. Ariz. to w.-central Calif.; known only from the type collection taken near Fort Mohave, Mohave Co., Ariz. Mar-Jun.

Kearney and Peebles (1951) question the label data for this species' type, noting that "in view of the known distribution of the species in California, the absence of later collections from Arizona, and the uncertainty of Lemmon's data of locality, it is improbable that *E. ordii* really occurs in this state." McDougall (1973) makes no statement regarding this species by simply ignoring its existence. However, a critical consideration of this is the name of the taxon itself. James L. Ord was a contract surgeon with the United States Army from 1846 to 1891, and in 1884 was stationed at Fort Mohave, Arizona. Watson (1886) indicates that he is naming the plant for Ord at the request of John G. Lemmon, and it seems reasonable that Lemmon could have found Ord only at Fort Mohave. Lemmon's field records are extant, but often difficult to understand, and as yet, I have found no reason to assume that the type of this species did not come from Arizona. Careful

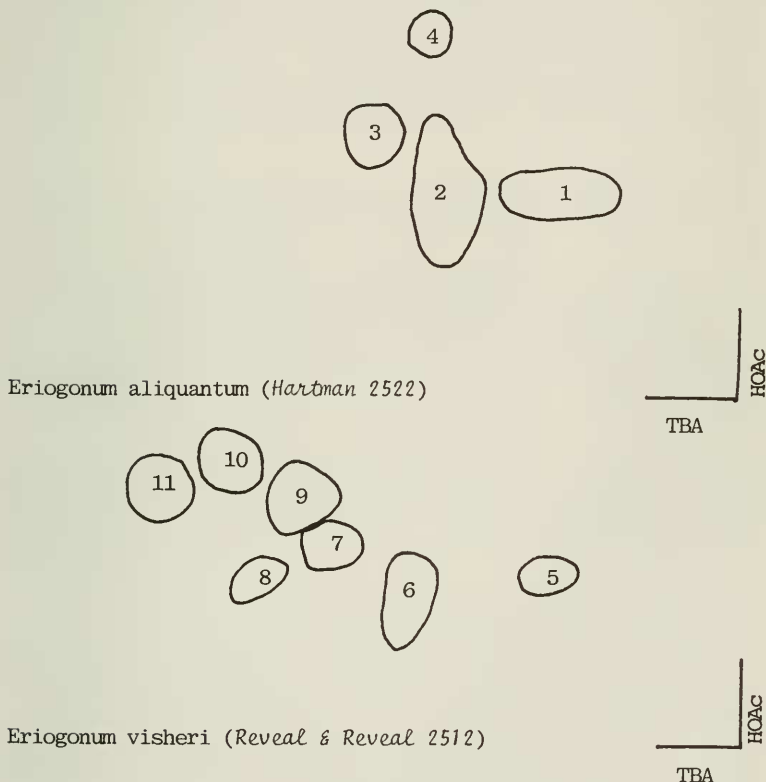
field studies in Mohave Co. may yet reveal this taxon in the Arizona flora. It is rarely found in the deserts of adjacent San Bernardino Co., California, where it seems to be restricted to the mountains.

39. *E. ALIQUANTUM* Reveal. Erect spreading herbaceous annuals 1.5--3.5 dm high arising from a slender, woody taproot; leaves basal and cauline, the basal leaf-blades elliptic to broadly elliptic, 1.5--2 cm long, 1--1.5 cm wide, glabrous and green on both surfaces except for sparsely scattered villous hairs along the margin and midvein, occasionally sparsely villous above when young, the margin entire and plane, the apex mostly obtuse, the base obtuse, the petiole slender, 1.5--2.5 cm long, sparsely villous, the petiole-base triangular, villous without, glabrous within, the cauline leaf-blades elliptic, 0.5--1.5 cm long, 0.2--1 cm wide, similar to the basal leaves only more reduced, the petiole short and the leaves restricted to the nodes in the axil of the bracts nearly throughout the plant; stems erect, slender, 3.5--7 cm long, sparsely villous with white hairs; inflorescences open, 1.5--2.5 dm long, mostly trichotomously branched at the first node, dichotomous above, sparsely villous throughout but becoming slightly less so above; bracts scalelike, ternate, triangular, 1--4 mm long, glabrous within and without except for the ciliated margins, connate basally; peduncles lacking except for a rare one in the fork of the first node in some, these erect, 3--7 mm long, villous; involucre turbinate-campanulate, 1--1.3 mm long, 1--1.2 mm wide, glabrous within and without except for a ciliated margin, the 5 acute teeth 0.4--0.6 mm long, the bractlets linear-oblongate, 1.5--2 mm long, minutely glandular with a few, white, marginal hairs at the apex in some, the pedicel 2--2.5 mm long, glabrous; flowers yellowish with a slightly darker yellowish-brown to brownish-red midrib, 1.2--1.5 mm long in anthesis, becoming 1.5--2 mm long, reddish in fruit, glabrous without, sparsely hispid along the margin of the tepals and otherwise glabrous within, the tepals essentially similar, oblongate, 0.4--0.7 mm wide, united about 1/5 the length of the flower; stamens slightly exserted, 1.3--1.5 mm long, the filaments glabrous, the anthers reddish-yellow, 0.3--0.4 mm long, oblong; achenes light brown to brown, 1.7--2.3 mm long, the large globose base tapering to a long, stoutish, 3-angled beak. -- Rare and highly restricted to clay hills s. of Cimmaron and near Philmont Scout Ranch, ca 6600 ft elev, Colfax Co., N.M. Jun-Aug.

Eriogonum aliquantum Reveal, sp. nov. *E. visheri* A. Nels. affinis, a qua imprimis differt floribus glabris, achaenis brevioribus et foliis angustioribus. -- **TYPUS:** On low clay, eroded hills east of an irrigation ditch 0.3 mile west of New Mexico Highway 21, 4.4 miles south of U.S. Highway 64 at Cimmaron, near the Philmont Scout Ranch, associated with low, scattered shrubs at ca 6600 ft elev, Colfax Co., New Mexico, 14 Jul 1972, Reveal & Reveal 2770. Holotype, US. Isotypes, to be distributed from US. Additional Collections: NEW MEXICO: Colfax Co.: Cimarroncito Road, 1/4 mi W of Philmont Scout Ranch Hdq., 31 Jul 1968, Hartman 2522

(RM, US); 1.2 mi S of Cimmaron on N.M. Hwy 21, 14 Jul 1972, Reveal & Reveal 2771 (BRY, NY, US).

This new species is clearly related to *Eriogonum visheri* which occurs in North and South Dakota on shallow, gravelly to rocky or clayey soils in the western parts of these two states. The two are morphologically similar in numerous ways, with *E. aliquantum* differing mainly in having glabrous flowers, shorter achenes, and narrower leaves. The aspect of the two are very similar. The new species was discovered by Ronald L. Hartman, then a student at the University of Wyoming, and at my request, ran a two dimensional flavonoid diagram on each species using the thin layer chromatography technique. Below are the results of Hartman's study:



As can be easily seen, the leaf flavonoid compounds of these two species are different, with only compounds 1, 2, 3, 5, 6, and 7 probably held in common.

I am grateful to Dr. Hartman, who has since graduated from the University of Texas, for his aid in this matter.

40. *E. GORDONII* Benth. in DC. [*E. trinervatum* Small.] Erect herbaceous annuals 1--4 (6) dm high; leaves basal, obovate to rounded or reniform, 1--5 cm long and wide, sparsely villous to hirsute on both surfaces, often becoming glabrous, the petiole 1--5 cm long; stems erect, 5--15 cm long, sparsely hispid at the base in some, otherwise glabrous; inflorescences open to \pm dense, 5--30 cm long, sparsely hispid or more commonly glabrous; peduncles slender, erect, 0.5--2 cm long, glabrous, rarely slightly hirsute or hispid near the base; involucre campanulate, 0.6--1.3 mm long, 0.8--1.5 mm wide, glabrous, 5-toothed; flowers white with greenish to reddish-brown midribs and bases, becoming pinkish to rose in fruit in some, 1--2.5 mm long, glabrous without, the tepals oblong-ovate to oblong; achenes light brown to brown, 2--2.5 mm long. -- Mostly on clay hills and flats from w. Neb. and s. Wyo. s. across e. Utah and w. Colo. to nw. N.M. and ne. Ariz.; Apache Co., Ariz. and San Juan Co., N.M. Jun-Sep.

Although not mentioned by Kearney and Peebles (1951, 1969) nor McDougall (1973), this species was collected by Deaver on Black Mountain in 1952 (MNA).

41. *E. CAPILLARE* Small. Erect herbaceous annuals 2--4 dm high; leaves basal, obovate to rounded, 1--3 cm long and wide, sparsely villous to hirsute and green on both surfaces, the margin entire, the apices rounded to obtuse, the bases truncate to rounded, the petiole 1--3 cm long, glabrate to sparsely hirsute; stems erect, 5--15 cm long, glabrous and glaucous; inflorescences open to dense panicated cymes, 1--3 dm long, \pm erect but spreading, glabrous to glaucous, trichotomously branched at the first node, dichotomously branched above, the ultimate branches often slender; peduncles slender, 1--3 cm long, erect and straight, glabrous and glaucous; involucre campanulate, 1--1.5 mm long and wide, glabrous without, the 5 acute to rounded teeth 0.3--0.5 mm long; flowers white with green or reddish midribs and bases, 0.8--1.2 mm long at anthesis, becoming 1.2--1.6 mm long and pinkish in fruit, glabrous, the tepals slightly dimorphic, the outer whorl of tepals pandurate with the two auriculated basal lobes wider and somewhat swollen when compared to the apex, those of the inner whorl oblanceolate with truncated apices; achenes brown to black, 1.3--1.6 mm long. -- Local and exceedingly rare, known from near San Carlos, Gila Co., and near Peridot, Graham Co., Ariz. Jul-Oct.

As already noted in the discussion of *Eriogonum arizonicum*, it and this species, *E. capillare*, have been terribly confused by Kearney and Peebles (1951) and Shreve and Wiggins (1964) so that it is only now, for the first time since the original description (Small 1898) that this rare plant has been adequately and accurately described. The species is still known to me only from a small number of collections, and this is in part due to the late season at which it flowers. I have considered this plant as "endangered" due to its rareness, the heavy grazing of animals on the San Carlos Indian Reservation, and the heavy highway traffic along U.S. Highway 70. It is now impossible to know to what extent the construction of San Carlos Lake has had on the rareness of this species.

42. *E. DEFLEXUM* Torr. in Ives. Erect to spreading herbaceous annuals (0.5) 1--7 (10) dm high; leaves cordate to reniform or nearly orbicular, 1--2.5 (4) cm long, 2--4 (5) cm wide, tomentose below, floccose to subglabrous and greenish above, the petiole 1--7 cm long; stems slender (ours) to fistulose, 3--30 cm long, glabrous; inflorescences erect or spreading, open to diffuse, 1--5 dm long, glabrous; peduncles lacking to 15 mm long, slender to stout, deflexed, glabrous; involucre narrowly turbinate to turbinate, 1--2.5 (3) mm long, 1--2.5 mm wide, glabrous without, 5-toothed; flowers white to pink, maturing reddish in some, 1--2.5 (3) mm long, glabrous without, the tepals dimorphic, those of the outer whorl ovate to oblong, the base obtuse to cordate, those of the inner whorl lanceolate to narrowly ovate; achenes brown to dark brown, (1.5) 2--3 mm long. -- Widespread and common from e. Calif. across Nev. to w. and s. Utah, s. through s. Calif. and Ariz. to Sonora and Baja Calif., Mex.; widespread and common in Ariz. except in the ne. portion of the state. May-Oct (Jan).

Since my review of this species (Reveal 1968a), I have added the var. *nevadense* (Reveal 1973) to the complex, applying this name to the phase of the species with sessile involucre found in the Great Basin of Nevada and Utah. As noted in 1968, the distinction between the two Arizona variants is slight, and the two tend to grade into each other.

VAR. *DEFLEXUM*. [*E. d. forma stenopetale* H. Gross.] Plants up to 5 dm high; peduncles 1--3 (5) mm long; involucre turbinate, 1.5--2 mm long, few flowered; flowers 1--2 mm long, the tepals oblong. -- Common throughout the range of the species; Mohave Co. e. to s. Navajo Co., and s. to Yuma Co., with scattered populations in Pinal, Pima, Maricopa, and Gila cos., Ariz. May-Sep (Oct).

VAR. *TURBINATUM* (Small) Reveal. [*E. t.* Small.] Plants up to 4 dm high; peduncles 3--5 mm long; involucre turbinate, 2--2.5 mm long, many flowered; flowers 1.5--2 mm long, the tepals subcordate. -- Common in s. Ariz. and n. Sonora, Mex.; widespread and common in s. Ariz. from Maricopa Co. e. to Greenlee Co. s. to the Mexico line. May-Oct (Dec.)

43. *E. HOOKERI* S. Wats. [*E. deflexum* Torr. in Ives ssp. *h.* (S. Wats.) S. Stokes.] Erect herbaceous annuals 1--6 dm high; leaves cordate to subreniform, (1) 2--5 cm long, 2--6 cm wide, tomentose on both surfaces or slightly less so above, the petiole 1--5 cm long; stems slender to stout, 0.5--3 cm long, glabrous; inflorescences spreading, subglobose to + flat-topped, up to 5 dm across, glabrous; peduncles lacking; involucre broadly campanulate to hemispheric, 1--2 mm long, 1.5--3 (3.5) mm wide, deflexed, glabrous, 5-toothed; flowers yellow, becoming reddish-yellow in fruit, 1.5--2 mm long, glabrous, the tepals dimorphic, those of the outer whorl orbicular or hastate, those of the inner whorl oblong; achenes light brown, 2--2.5 mm long. -- Infrequent to locally common from e. Calif. to sw. Wyo., w. Colo., n. Ariz. and perhaps nw. N.M.; known

from Coconino and Mohave cos., Ariz., but to be expected in n. Apache Co., Ariz., and nw. San Juan Co., N.M. Jul-Oct.

44. *E. BRACHYPODUM* Torr. & Gray. [*E. parryi* A. Gray. *E. deflexum* Torr. in Ives var. *b.* (Torr. & Gray) Munz. *E. d.* ssp. *b.* (Torr. & Gray) S. Stokes. *E. d.* ssp. *p.* (A. Gray) S. Stokes.] Low spreading to erect herbaceous annuals 0.5--3 (4) dm high; leaves orbicular to cordate, 1--3 (4) cm long, (1.5) 2--4 (5) cm wide, densely tomentose below, tomentose to subglabrous and green above, the petiole 1--4 cm long; stems slender to stout, 2--7 cm long, glandular; inflorescences horizontal in low, flat-topped crowns, or spreading and forming more open, subglobose crowns, the branches glandular throughout; peduncles slender to stoutish, up to 15 mm long, deflexed, glandular; involucre turbinate to campanulate, 1--2.5 mm long, 1.5--2.5 mm wide, glandular without, 5-toothed; flowers white to reddish, 1--2.5 mm long, glabrous, the tepals dimorphic, those of the outer whorl oblong to ovate with cordate to auriculate bases, those of the inner whorl oblanceolate; achenes brown to blackish-brown, 1.5--2 mm long. -- Widespread and common, often forming weedy patches along the highways from e. Calif. e. across s. Nev. to sw. Utah and nw. Ariz.; known only from Mohave Co., Ariz. Mar-Oct.

In my revision of the *Eriogonum deflexum* complex (Reveal 1968a) I proposed that *E. parryi* be considered a synonym of *E. brachypodum* as the supposed differences between the two (mainly the length of the peduncles) simply did not hold up under critical examination. The type of *E. parryi* was a young individual collected early in the growing season, and most young plants of *E. brachypodum* show the open, spreading habit, although the involucre may or may not be as long as in the Utah population named for Parry. The two species cannot be maintained.

45. *E. INSIGNE* S. Wats. [*E. exaltatum* M. E. Jones. *E. deflexum* Torr. in Ives var. *i.* (S. Wats.) M. E. Jones. *E. d.* ssp. *i.* (S. Wats.) S. Stokes. *E. d.* ssp. *e.* (M. E. Jones) S. Stokes.] Tall erect herbaceous annuals (0.5) 3--10 dm high; leaves subcordate to orbicular, (1.5) 2--5 (8) cm long and wide, tomentose below, floccose to subglabrous and greenish above, the petiole 1--10 cm long; stems stout, (0.2) 2--20 cm long, glabrous; inflorescences narrow, strict, (0.5) 1--8 dm long, glabrous, the branches long and whip-like with racemously arranged involucre at the tips; peduncles erect, up to 2 mm long, glabrous; involucre turbinate, 2--2.5 (3) mm long, 1.5--2.5 mm wide, glabrous, 5-toothed; flowers white with greenish to reddish midribs and bases, 1.5--2 mm long, glabrous, the tepals dimorphic, those of the outer whorl oblong with cordate bases, those of the inner whorl oblanceolate; achenes dark brown to blackish, 2--2.5 mm long. -- Local and often rare in sandy soil from s. Calif. across s. Nev. to sw. Utah and nw. Ariz.; known only from Mohave Co., Ariz. May-Oct.

This is another of the many species of *Eriogonum* not included in McDougall's (1973) recent flora of northern Arizona although

its presence in Arizona had been reported earlier (Reveal 1968a).

46. *E. SCABRELLUM* Reveal. Erect and spreading herbaceous annuals 1--5 dm high; leaves cordate, 1--3 cm long and wide, densely tomentose below, floccose above, the margin crisped and wavy, the petiole 1--4 cm long; stems slender, 5--15 cm long, sparsely to rather densely tomentose, scabrellous throughout; inflorescences + flat-topped, 0.5--4 dm high and across, the branches lightly to sparsely floccose, becoming less obviously so in age, scabrellous throughout; peduncles lacking; involucre turbinate, 1.5--2.5 mm long, 1.5--2 mm wide, horizontally arranged on the branches, becoming somewhat deflexed with age, arising from the bracts along the edge of the branch, the tube scabrellous, 5-toothed; flowers white to pink or rose to red, 1--1.5 mm long, pustulose without, the tepals dimorphic, those of the outer whorl obovate with obtuse bases, those of the inner whorl ovate; achenes light brown, 2 mm long. -- Rare and locally common on clay hills and flats in e. Utah and w. Colo.; to be expected in extreme n. Coconino or Apache cos., Ariz. or extreme nw. San Juan Co., N.M. (Jul) Aug-Oct (Nov).

This late fall flowering species of the *Eriogonum deflexum* complex has, in recent years, become better known insofar as its distribution (Reveal 1973). I have seen it now from Grand Co., Utah south to San Juan and Kane cos., Utah, mainly along the Colorado River drainage system. In Colorado, it is in Mesa Co., also along the Colorado River, but in Montezuma Co. (and in San Juan Co., Utah, also) it is along the San Juan River drainage. I suspect that it will be found eventually in both Arizona and New Mexico if sought for in the late summer and fall of the year.

47. *E. CERNUUM* Nutt. [*E. c.* var. *tenue* Torr. & Gray. *E. c.* var. *umbraticum* Eastw. *E. c.* ssp. *t.* (Torr. & Gray) S. Stokes.] Low to high, spreading to erect herbaceous annuals 0.5--6 dm high; leaves basal or sheathing up the stems, ovate to orbicular, (0.5) 1--2 (2.5) cm long and wide, densely tomentose below, tomentose to floccose or subglabrous and greenish above, the petiole 1--4 cm long; stems slender, 0.3--2 dm long, glabrous; inflorescences open, erect or spreading, 0.5--5 dm high and up to 4 dm across, the branches glabrous and often glaucous; peduncles lacking or (in ours) present, slender, cernuous, spreading or ascending, 1--25 mm long, glabrous; involucre turbinate, (1) 1.5--2 mm long, 1--1.5 mm wide, glabrous, 5-toothed; flowers white to pinkish with greenish to reddish midribs and bases, 1--2 mm long, glabrous, the tepals dimorphic, those of the outer whorl panduriform with crisped or slightly wavy margins, those of the inner whorl obovate; achenes light brown to brown, 1.5--2 mm long. -- Common and widespread throughout much of central North America, from e. Calif. e. to Colo., and from sw. Can. s. to Ariz. and N.M.; common across the n. tier of cos. in Ariz. into N.M. as far e. as Santa Fe Co. and as far s. as Catron Co. Jun-Oct.

Our plants belong to var. *cernuum*, with the var. *viminale* (S. Stokes) Reveal in Munz restricted to the Great Basin area of Utah

and Nevada essentially. The var. *umbraticum* was a named proposed for those plants of the typical variant which have sheathing leaves. The distinction is not worthy of consideration.

48. *E. ROTUNDIFOLIUM* Benth. in DC. [*E. cernuum* Nutt. ssp. *r.* (Benth. in DC.) S. Stokes. *E. c.* ssp. *glaucescens* S. Stokes. *E. r.* var. *angustius* Goodman.] Low spreading herbaceous annuals 0.5--4 dm high; leaves orbicular to cordate, 1--2 cm long, 1--2.5 cm wide, tomentose below, floccose to subglabrous and grayish or greenish above, the petiole 1.5--4 cm long; stems slender, 1--5 (7) cm long, glabrous; inflorescences open, spreading, \pm flat-topped, glabrous and frequently glaucous throughout; peduncles stoutish, erect, 3--15 mm long, glabrous; involucre turbinate to campanulate, 1--2 mm long, 1.5--2.5 mm wide, glabrous without, 5-toothed; flowers white to rose or red, 1--2 mm long, glabrous, the tepals dimorphic, those of the outer whorl flabellate, 1--2.5 mm wide, those of the inner whorl lanceolate, 0.4--0.7 mm wide; achenes dark brown to blackish, 1.5--2 mm long. -- Locally common in widely scattered locations from N.M. and central and w. Tex. s. to se. Ariz., Coahuila and Chihuahua, Mex.; from Valencia and De Baca cos., N.M., s. to Greenlee and Cochise cos., Ariz. Apr-Oct.

This species is easy to distinguish from *Eriogonum cernuum* by the features presented in the flower, involucre, and peduncle, and the two need never be confused. Why Stokes (1936) proposed ssp. *glaucescens* is beyond me as it falls well within any definition of the species.

49. *E. THURBERI* Torr. [*E. panduratum* S. Wats. *E. cernuum* Nutt. ssp. *t.* (Torr.) S. Stokes. *E. c.* ssp. *viscosum* S. Stokes.] Low spreading to roundish herbaceous annuals 0.5--4 dm high; leaves oblong-ovate, 0.4--4.5 cm long, 0.5--3 cm wide, tomentose below, floccose to glabrate and dark green above, the margin usually rugulose, the petiole 1--3 cm long; stems slender, 0.3--1 dm long, wooly-pubescent and sparsely to densely glandular; inflorescences open to compactly branched, spreading, 0.5--3 dm long, sparsely glandular to glabrate; peduncles erect, capillary, 5--25 mm long, glabrous with the upper end glandular-puberulent; involucre broadly turbinate, 1.8--2 mm long and wide, minutely glandular-puberulent without, 5-toothed; flowers white to red or rustic, 1--1.7 mm long, glabrous except for the glandular-puberulent base without, glabrous within except for a tuft of long white hairs about midlength, the tepals dimorphic, those of the outer whorl broadly pandurate or flabellate, 1--2 mm across, those of the inner whorl oblanceolate, 0.2--0.5 mm wide; achenes brown to black, 0.6--0.8 mm long. -- Widely scattered and usually infrequent to weedy from s. Calif. and s. Ariz., s. to nw. Mex.; from Mohave Co. se. to Graham and Cochise cos., w. to Yuma Co., Ariz. Mar-Jul (Oct).

This is a common desert species in much of western and southern Arizona. It is to be expected in extreme southwestern New Mexico, but I have seen no specimens. The type of *Eriogonum panduratum* may have been collected in Arizona.

50. *E. THOMASII* Torr. [*E. minutiflorum* S. Wats.] Low spreading herbaceous annuals 0.5--3 dm high; leaves round to round-reniform, 5--20 mm long and wide, densely tomentose below, floccose to glabrate above, the petiole 5--30 mm long; stems slender, 2--10 cm long, glabrous except for a few scattered glands near the base in some; inflorescences spreading, open to diffuse, 0.5--2.5 dm long and across, glabrous; peduncles spreading, capillare, 5--20 mm long, glabrous; involucre turbinate-campanulate, 0.6--1.2 mm long, 0.7--1.3 mm wide, glabrous, 5-toothed; flowers yellow and 0.8--1 mm long at anthesis, becoming white to rose and 1.2--2 mm long in fruit, short-hispidulous without, the tepals dimorphic, those of the outer whorl plane in early anthesis but soon becoming saccate-dilated on each side of the cordate base, the inflated area often white to pink, those of the inner whorl spatulate and often as long to slightly longer than the tepals of the outer whorl; achenes brown to dark brown, 0.8--1 mm long. -- Infrequent to common in sandy soil from se. Calif. e. across s. Nev. to sw. Utah, and s. through w. Ariz. to nw. Mex.; Mohave and Yuma cos. e. across the s. part of Ariz. to Graham Co. Feb-Jun (Aug).

Care must be taken in identifying this species to look closely at the outer tepals, and especially the base of the tepals. When mature, the flowers are prominently saccate, but when immature, the flowers (and plants) can be confused with *Eriogonum pusillum*. A simple way of discriminating between the two is in the shape of the leaves, with those of *E. thomasi* round to reniform in outline and densely tomentose but dark green to even reddish-green above, while the leaves of *E. pusillum* are usually longer than broad, densely tomentose below but with longer hairs and yellowish-green on the upper surface.

51. *E. PUSILLUM* Torr. & Gray. [*E. comosum* (M. E. Jones) M. E. Jones var. *playanum* M. E. Jones. *E. reniforme* Torr. & Frém. ssp. *pusillum* (Torr. & Gray) S. Stokes. *E. r.* var. *playanum* (M. E. Jones) S. Stokes.] Spreading herbaceous annuals 0.5--3 dm high; leaves oblong-ovate to rounded, 0.5--2 (3) cm long, 0.4--2 (2.5) cm wide, densely tomentose below, floccose to subglabrous and greenish-yellow above, the hairs infrequently glandular, the petiole 1--3 cm long; stems slender, 1--8 cm long, glabrous except for scattered glands at the base in some; inflorescences open, spreading, 0.5--2.5 dm long and across, glabrous throughout; peduncles slender, 1--3.5 (4) cm long, spreading to ascending, glabrous; involucre broadly turbinate to campanulate, 1--1.5 (1.7) mm long, 1.5--3 mm wide, glandular without, 5-toothed; flowers yellow and 1--1.7 mm long in anthesis, becoming reddish-yellow and 2--2.5 mm long in fruit, glandular without, the tepals dimorphic, those of the outer whorl oblong-elliptic to obovate, those of the inner whorl oblong; achenes dark brown, 0.6--0.8 mm long. -- Infrequent to weedy and common in sandy to gravelly places from se. Ore. and sw. Ida. s. to s. Calif., and e. across s. Nev. to sw. Utah and w. Ariz.; known from nw. Mohave Co. and Walnut Canyon, Coconino Co., Ariz. Mar-Jul (Aug).

52. *E. RENIFORME* Torr. & Frém. [*E. r.* var. *comosum* M. E. Jones. *E. c.* (M. E. Jones) M. E. Jones.] Spreading herbaceous annuals 0.5--4 dm high; leaves round to reniform, 5--20 mm long and wide, tomentose below, tomentose to subglabrate and greenish above, the petiole 0.5--6 cm long; stems slender, 2--8 cm long, glabrous except for scattered hairs at the base; inflorescences open, spreading, 0.5--3.5 dm long, glabrous; peduncles slender to capillary, 3--15 mm long, glabrous; involucre broadly turbinate to subcampanulate, 1.5--2 (2.5) mm long and wide, glabrous without, 5-toothed; flowers yellowish to yellowish-red, 1--2 mm long, glandular without, the tepals slightly dimorphic, those of the outer whorl broadly ovate, those of the inner whorl oblong; achenes brown, 0.8--1 mm long. -- Locally common to infrequent from s. Calif. and s. Nev. s. to w. Ariz.; in widely scattered locations in Mohave and Yuma cos., Ariz. Mar-Jun (Aug).

The usual distinction between *Eriogonum pusillum* and *E. reniforme* is in the pubescences of the involucre; in the former, the involucre is glandular without, while in the latter it is glabrous. This is a constant and easily observed feature, but others are present as well. For example the leaves of *E. reniforme* are covered with a dense, wooly tomentum, while in *E. pusillum* the tomentum is not as thick nor as wooly. The stems of the former tend to be reddish and are several from the base of the plant, and spread outwardly in a gentle arc, while in the latter the stems are usually yellowish-green and usually only one which is erect. Attempts to include both within a single species cannot stand as even in mixed populations (as seen in southern Nevada), the two remain distinct and no hybrids have ever been observed.

53. *E. WETHERILLII* Eastw. [*E. sessile* Stokes ex Jones. *E. filiforme* L. O. Williams.] Low spreading herbaceous annuals 0.5--2.5 dm high; leaves oblong to orbicular, (0.5) 1--4 cm long, (0.5) 1--3 cm wide, densely tomentose below, floccose to subglabrous above, the petiole 1--5 cm long; stems slender, 1--5 cm long, glabrous except for villous bases in most; inflorescences compact and densely branched, 0.5--2 dm high, up to 4 dm across, the numerous branches becoming dark red with age, glabrous; peduncles filiform, erect, (3) 5--10 mm long, becoming shorter or lacking in the upper nodes in some, glabrous; involucre turbinate, (0.3) 0.5--1 mm long and wide, 4-toothed; flowers yellow to red, 0.6--1.2 mm long in anthesis, becoming pinkish to rose or red and 1--1.5 mm long in fruit, glabrous, the tepals elliptic to obovate; achenes brown to black, 0.6--1 mm long. -- Common and occasionally weedy in deep sandy soil in se. Utah, w. Colo., nw. N.M. and n. Ariz.; Coconino Co., Ariz., e. to San Juan Co., N.M. (Apr) Jul-Sep (Oct).

54. *E. SUBRENIFORME* S. Wats. [*E. filicaule* S. Stokes.] Tall to slightly spreading, erect herbaceous annuals 0.5--4 (6) dm high; leaves orbicular to reniform, (0.5) 1--3.5 cm long, (0.5) 1--4 cm wide, tomentose below in nearly straight hairs, hirsute to floccose or glabrous above, the petiole (1) 2--6 cm long; stems slender to

stoutish, 2--15 (20) cm long, glabrous except for the hispid bases; inflorescences open to \pm diffuse, 0.5--4 dm long, up to 5 dm across, glabrous throughout; peduncles filiform, 0.5--2.5 cm long, glabrous; involucre turbinate, 0.5--1 mm long, 0.6--0.9 mm wide, glabrous without, 5-toothed; flowers white to rose, 0.8--2 mm long, glabrous or sparsely hirsute without, the tepals lanceolate to spatulate or elliptic to ovate; achenes light brown, 1.7--2 mm long. -- Infrequent and usually local on clay hills and slopes from s. Utah s. to n. Ariz. and disjunct into nw. N.M.; extreme ne. Mohave Co. and adjacent nw. Coconino Co., Ariz., and from central Apache Co., Ariz. e. to w. McKinley Co., N.M. Apr-Aug (Sep).

The distribution of this species is divided into two discrete units. The largest unit extends across southern Utah from Washington Co. to western San Juan Co., and northward to Garfield Co., and southward into northwestern Arizona in northeastern Mohave and adjacent northwestern Coconino cos. The smaller unit occurs in central Apache Co., Arizona, and extends into western McKinley Co., New Mexico. I have not detected any differences between the two units.

A related species, *Eriogonum viscidulum* J. T. Howell, known only from sandy hills near Bunkerville, Clark Co., Nevada, may be eventually found in northwestern Arizona. It has viscid stems and branches, and yellow flowers 1.3--2 mm long. It is rare and considered "endangered" in its present location.

55. *E. ABERTIANUM* Torr. in Emory. Low to tall or spreading sparsely to profusely branched herbaceous annuals 0.5--6 dm high; leaves basal and cauline, the basal leaf-blades oblong to ovate, 1--4 cm long, 1--3 cm wide, villous to hoary on both surfaces, the petiole 0.5--6 cm long, the cauline leaf-blades linear, lanceolate, or narrowly obovate, similar to the basal leaves only sessile or nearly so; stems prostrate to erect, appressed-hirsute throughout, usually leafy; inflorescences open to compact, 0.5--4 dm long, hirsute; bracts semifoliateous, 3--6, linear to linear-lanceolate, 2--10 mm long, 1--3 mm wide; peduncles, when present, slender, ascending to erect, 0.5--6 cm long, villous to hoary throughout; involucre broadly campanulate, the involucral tubes 2--3 mm long with 5 oblong lobes 4--6 mm long and 1--2 mm wide, these usually reflexed, villous-canescens; flowers white to reddish or rose, 3--4.5 mm long, glabrous, the tepals dimorphic, those of the outer whorl orbicular-cordate, 1.8--3 mm long, 2--4 mm wide, those of the inner whorl lanceolate to spatulate, 3--4.5 mm long, 0.7--1.2 mm wide; achenes brown to dark brown, 1--1.6 mm long. -- Widespread and common from central and s. Ariz., central and s. N.M., and w. Tex. s. into Sonora, Chihuahua, and Coahuila, Mex., s. to San Luis Potosí, Mex.; common and often weedy in the s. half of Ariz. and N.M. (Mar) Apr-Oct (Dec).

To say this species is highly variable is an understatement. It is not only highly variable in terms of general gross morphology, it is even highly variable in terms of its growth pattern during the growing season so that at one time of the year it may be

a low, spreading, densely villous or hoary plant as in the spring of the year, whereas the same plant will be a tall, open, sparsely branched plant with little hair in the fall of the year. I am not as yet satisfied with my current division of the species into infraspecific units. The two variants occur together, do not seem to form hybrids, and behave as distinct species. However, until the plants are fully mature, it is impossible to distinguish the two variants! The var. *abertianum*, as defined here, may ultimately be divided into two variants, the typical form, and a second characterized by the type of *Eriogonum abertianum* var. *ruberrimum*. I am reluctant to make such a division for I simply do not know how to distinguish between the two except as to a "gestalt" I have developed as a result of field work. My concept of the species, as expressed in a review of the species in Texas (Reveal 1968c), has changed to a point that allows for the recognition of two forms, but in herbaria (ca 1968--1973), I called var. *cyclosepalum* (as recognized here) incorrectly var. *ruberrimum*, not realizing that the type of that plant was actually a form closer to var. *abertianum* than to the plants I was so labelling this name. Much more field and herbarium work is needed on this species.

VAR. ABERTIANUM. [*E. a.* var. *neomexicanum* Gandoger. *E. a.* var. *ruberrimum* Gandoger. *E. pinetorum* Greene. *E. a.* ssp. *p.* (Greene) S. Stokes. *E. a.* var. *villosum* Fosberg. *E. a.* var. *gillespiei* Fosberg. *E. cyclosepalum* Greene var. *g.* (Fosberg) I. M. Johnston.] Mature plants paniculately branched in the upper inflorescences; peduncles not axillary; bracts small and inconspicuous so that mature plants do not appear to be leafy in the upper inflorescences. -- Widespread and common from central Ariz. and N. M. s. to n. Mex. and extreme w. Tex.; common throughout Ariz. in all but the n. cos., and in N.M. in all but the n. tier of cos. (Feb) Mar-Oct (Dec).

As here defined, var. *abertianum* is composed of two elements. The typical phase is an erect, open plant with long peduncles which are more than 1 mm long, and a flower that is usually cream-colored and not reddish. The var. *ruberrimum* phase, in a strict sense, is a strict, erect plant with peduncles less than 1 mm long, and flowers which are usually reddish. In both cases, it should be noted, the bracts are small, and the inflorescence in paniculately branched. The typical phase is common in central New Mexico and nearly all of Arizona, but gives way to the *ruberrimum* phase in a gradual series of steps in southern New Mexico and in Cochise Co., Arizona. In northern Mexico (and parts of southern New Mexico), these two phases are distinct and readily separated in fruit. The immature stages are impossible to separate as of this writing.

VAR. CYCLOSEPALUM (Greene) Fosberg. [*E. c.* Greene. *E. lappulaceum* Greene. *E. a.* ssp. *c.* (Greene) S. Stokes. *E. a.* ssp. *l.* (Greene) S. Stokes. *E. a.* var. *l.* (Greene) Fosberg. *E. a.* var. *bracteatum* Fosberg.] Mature plants in erect strict, non-paniculate branching in the upper inflorescences; peduncles axillary;

bracts large and conspicuous so that mature plants appear leafy in the upper inflorescences. -- Widespread and common from s. N.M. and extreme se. Ariz. e. to w. Tex. s. to San Luis Potosí, Mex.; s. two tiers of cos. in N.M. and extreme se. Ariz. (mainly Cochise Co.). (Feb) Mar-Oct (Dec).

This is the appressed, leafy phase with usually sessile involucre, reddish to yellowish flowers, and a stiff, erect appearance (in some) or a low, spreading and nearly matted aspect (as in the plants of most of Mexico and Texas) which branch from the base. The zone of overlap between these two varieties, as recognized here, is in southern New Mexico (especially in Dona Ana Co.) and in southeastern Arizona. Once again, I have not been able to establish a set of clear criteria for distinguishing the plants of these varieties when they are immature or in early anthesis. The several varieties proposed by Fosberg (1938) have been tentatively segregated on the basis of the distribution of the mature plants.

56. *E. PHARNACEOIDES* Torr. in Sitgr. Erect herbaceous annuals 1--5 dm high; leaves basal and cauline, the basal leaf-blades linear-lanceolate to linear-ob lanceolate, (1) 2--4 cm long, 1--4 mm wide, lanate below, villous and greenish above, the petiole 1--5 mm long, the cauline leaf-blades linear, 0.5--2.5 cm long, 0.5--3 mm wide, tomentose below, thinly villous to glabrous above, sessile; stems erect, villous, leafy; inflorescences open, 0.5--4.5 dm long, villous throughout; bracts semifoliateous, 3--8, linear, (3) 5--15 mm long, 0.3--1.5 (2) mm wide; peduncles slender, erect or nearly so, (1) 2--5 (7) cm long, sparsely villous to glabrous; involucre campanulate, the involucral tubes 1--2 mm long, 2--3 mm wide, with 5 lanceolate lobes 1--3 mm long and 0.5--1 mm wide, these erect or nearly so, villous; flowers white to rose or yellow, 1--3 mm long, glabrous, the tepals dimorphic, those of the outer whorl oblong-ovate with two large saccate parts developing at the base of each tepal, those of the inner whorl linear-oblong and not forming saccate bases; achenes brown to blackish, 1.8--2 mm long. -- Widespread and rare to common mainly in sandy to gravelly places from se. Nev. and sw. Utah. se. across Ariz. to sw. N.M.; Mohave and Coconino cos. se. through Yavapai Co. to all other cos. except Yuma, and in sw. N.M. from Catron and Socorro cos. s. to Hidalgo Co. Jul-Oct.

There are two variants of this species in our area. The typical form is widespread and relatively common, while the var. *cervinum* is known only from Mohave Co., Arizona.

VAR. *PHARNACEOIDES*. [*E. arizonicum* Gandoger, non Stokes ex Jones, see number 33 of this treatment.] Flowers white to cream. Widespread throughout the range of the species in Ariz. and N.M. Jul-Oct.

VAR. *CERVINUM* Reveal. Flowers yellow. -- Rare and local, Lincoln Co., Nev. e. to Washington, Iron and Millard cos., Utah, s. to Mohave Co., Ariz.; known only from Mt. Trumbull, Mohave Co., Ariz.

Jul-Sep.

The var. *cervinum* was only recently described (Reveal 1974b) but has been known since the 1890s. My Arizona record is based on Merkle & Merkle 930 (GCNP).

57. *E. MACULATUM* Heller. [*E. angulosum* Benth. var. *m.* (Heller) Jeps. *E. a.* ssp. *m.* (Heller) S. Stokes.] Low spreading herbaceous annuals 1--2 (3) dm high; leaves basal and cauline, the basal leaf-blades lanceolate to obovate, 1--3 (4) cm long, 1--1.5 (2) cm wide, tomentose below, floccose to glabrate above, the margin entire or crisped to slightly revolute in some, the petiole 0.5--1 cm long, the cauline leaf-blades lanceolate to oblanceolate, 0.5--2 cm long, 3--10 mm wide, otherwise similar to the basal leaves only sessile; stems slender, 2--8 cm long, mostly smooth or faintly angled in some, tomentose to floccose; inflorescences mostly open, spreading, 0.4--2.5 dm high and up to 3 dm across, tomentose to floccose throughout; peduncles filiform, spreading, (5) 10--30 mm long, often glandular-puberulent or glabrous; involucre campanulate, 1--1.5 (2) mm long, 1.5--3 (3.5) mm wide, glandular-puberulent without, 5-toothed; flowers white to yellow or pink to red with a large conspicuous rose to purple midrib spot, 1--2.5 mm long, glandular-puberulent without, the tepals dimorphic, those of the outer whorl elliptic to roundish or obovate with an inflated area at the base and the middle with the sides of the tepal incurved below, those of the inner whorl lanceolate to obtuse and extending beyond the apex of the outer tepals; achenes light brown, 1--1.5 mm long. -- Rather common and widespread from s. Wash. and s. Ida., s. in e. Calif. to extreme n. Baja Calif., Mex. and e. across Nev. to w. Utah and w. Ariz.; Mohave and Yavapai cos. s. to Yuma Co., and e. to Cochise Co., Ariz. Apr--Nov.

SUBGENUS OREGONIUM (S. WATS.) GREENE

58. *E. DAVIDSONII* Greene. [*E. baileyi* S. Wats. var. *d.* (Greene) M. E. Jones. *E. juncinellum* Gandoger. *E. molestum* S. Wats. var. *d.* (Greene) Jeps. *E. vimineum* Dougl. ex Benth. ssp. *j.* (Gandoger) S. Stokes. *E. v.* var. *d.* (Greene) S. Stokes.] Rather tall and erect herbaceous annuals 1--2 (3) dm tall; leaves mostly reniform to round, 1--2 cm long and wide, densely white-tomentose below, floccose to glabrate above, the petiole 1--3 cm long; stems erect, slender, 0.5--1 dm long, glabrous; inflorescences rather strict, erect, 0.5--2.5 dm long, up to 3 dm wide, glabrous throughout; involucre cylindric-turbinate, (2.5) 3--4 (5) mm long, 1--2 mm wide, glabrous without, the 5 acute teeth 0.2--0.4 mm long; flowers white to pink, 1.5--2 mm long, glabrous, the tepals oblong-obovate to oblong, the inner tepals only slightly narrower; achenes brown, 2 mm long. -- Rare and local to common and occasionally weedy from s. Calif. s. to Baja Calif., Mex., and e. in n. Ariz. and sw. Utah; known from Mohave, Coconino, Yavapai, and Gila cos., Ariz. Apr--Sep.

In Arizona, this plant has been called either *Eriogonum vimineum* Dougl. ex Benth. (Kearney & Peebles 1951; McDougall 1973) or less frequently, *E. juncinellum* Gandoger. Recently, however, this plant has had the name *E. davidsonii* applied to it (Reveal & Munz 1968; Reveal 1973), and that appears to be the correct name for our material. *Eriogonum vimineum* itself is a Pacific Northwest species as it occurs from Washington and Idaho southward through eastern Oregon into northern California and northern Nevada. *Eriogonum davidsonii* seems to be a southern element restricted to the mountains of southern California and northern Baja California, Mexico, eastward into southwestern Utah and western Arizona. The first is a low, spreading plant with usually several stems from the base of the plant, while the latter is an erect, strict plant with usually only a single stem at the base. This species complex is particularly difficult in California where the problem is aggravated at the moment by undescribed species which are now confused with either of these two species. Once those undescribed species are proposed, the distinction between *E. vimineum* and *E. davidsonii* will become much more obvious.

59. *E. NIDULARIUM* Cov. [*E. vimineum* Dougl. ex Benth. ssp. n. (Cov.) S. Stokes.] Low to weakly erect herbaceous annuals (0.5) 1--3 dm high; leaves basal, rounded or nearly so, 0.5--2 cm long and wide, tomentose below, tomentose to floccose or rarely glabrous above, the petiole 1--3 cm long; stems spreading, 3--8 cm long, floccose, usually numerous from the base; inflorescences dense, forming compact masses of numerous floccose branches 3--28 cm long, the tips of these branches often curving inwardly so as to form an inverted haystack; involucre turbinate, 1 mm long, 0.5--0.7 mm wide, floccose without, scattered along the branches and closely appressed to the stem, the 5 acute teeth 0.2--0.4 mm long; flowers yellow to reddish-yellow, 1.5--2 (3) mm long, glabrous, the tepals dimorphic, those of the outer whorl broadly fan-shaped, those of the inner whorl narrower and remaining erect; achenes brown, 1 mm long. -- Locally common in widely scattered locations in the deserts of w. Utah and Ariz. w. across s. Nev. to e. Calif., then n. along the w. edge of Nev. to se. Ore. and sw. Ida.; known only from Mohave Co., Ariz. Apr--Oct.

This is a distinct and clearly marked species of *Eriogonum* which cannot be readily confused with any other taxon, especially in Arizona. The densely compact stems and branches, coupled with the yellowish to yellowish-red flowers in small, tightly appressed involucre make it easy to distinguish at any time of the year. In Arizona, it is restricted to Mohave Co.

60. *E. PALMERIANUM* Reveal in Munz. [*E. plumatella* Dur. & Hilg. var. *palmeri* Torr. & Gray, non *E. palmeri* S. Wats. *E. baileyi* S. Wats. var. *tomentosum* S. Wats.] Low spreading herbaceous annuals 1--3 dm high; leaves basal, suborbicular to cordate, 0.5--1.5 cm long, 0.5--2 cm wide, densely tomentose below, less so to glabrate above, the petiole 1--4 cm long; stems open and spreading,

3--8 cm long, floccose to tomentose, one to few from the base; inflorescences open, forming loose spreading crowns of few floccose to tomentose branches, 0.5--2.5 dm long, up to 3 dm across, the tips of the branches spreading outwardly, not curving inwardly at all; involucre campanulate, 1.5--2 mm long and wide, floccose to tomentose without, only a few scattered along the branches and closely appressed to the stem, the 5 acute teeth 0.4--0.7 mm long; flowers white to pink, 1.5--2 mm long, glabrous, the tepal slightly dimorphic, those of the outer whorl narrowly fan-shaped, those of the inner whorl slightly narrower and erect; achenes brown, 1.5--1.8 mm long. -- Locally common and widespread from s. and e. Calif. e. across s. Nev. to s. and w. Utah, and into extreme sw. Colo. s. across most of Ariz. into w. N.M.; widespread in all cos. of Ariz. except Navajo, Apache, and Yuma, and known presently only from Grant and Hidalgo cos., N.M., but to be expected in Catron. Jun--Oct.

Since this species was proposed (Reveal & Munz 1968), some confusion has developed over its definition. In large part this is due to the long, and well-established misapplication of the name *Eriogonum densum* Greene which was wholly misunderstood by Stokes (1936, and herbaria annotations) and thus past on to Kearney and Peebles (1951) in the Arizona literature. In California, Jepson (1913) misapplied the name *E. baileyi* var. *tomentosum* in that he applied the name to two distinct elements, one applies to the type of var. *tomentosum* which I am now calling *E. palmerianum*, and a second which applies to the tomentose phase of *E. baileyi*, which I am now calling *E. baileyi* var. *divaricatum* (Gandoger) Reveal (or *E. commixtum* Greene if one wishes to use a specific name). Munz and Keck (1959) continued the confused application of the name in their flora of California, and more recently, Howell (1976) followed this point of view. McDougal (1973) has gone so far as to place both *E. nidularium* and *E. palmerianum* under *E. densum*, but based upon his description he is including only the first two elements in his treatment as the description does not apply to *E. densum* in any fashion. To resolve this confusion, hopefully once and for all, the following discussion is appended here:

Eriogonum nidularium may be quickly distinguished from *E. densum* and *E. palmerianum* by flower color. In this species, the flowers are yellowish to yellowish-red (except for a single pale-yellow flowered population discovered in Nye Co., Nevada). Also, the outer tepals are broadly fan-shaped and of a much broader width than the inner tepals. The upper branches tend to bend inwardly at the top, and in larger plants, the stems and branches are so numerous that the plants appear as a single, compact mass.

Eriogonum palmerianum is white-flowered, and the tepals are only narrowly fan-shaped, that is, the upper portion of the tepal blade is not as expanded as that seen in *E. nidularium*. Likewise, the size difference between the outer and inner tepals of *E. palmerianum* is not as pronounced. The upper branches of this species are never incurved nor so massed as to form a dense crown. Rather

the branches are few in number, open and generally spreading at all angles to give the plants a less organized appearance. The branches are generally gently curved and usually more stout than those seen in *E. nidularium*. *Eriogonum palmerianum* also differs from *E. nidularium* in having longer involucres and achenes, but generally shorter flowers.

Eriogonum baileyi var. *divaricatum* is not related to either of the two species discussed above. However, as it has been confused with *E. palmerianum*, it is necessary to discuss it briefly. First, the flowers of var. *divaricatum* are glandular-puberulent without, and the tepals are not fan-shaped. The pubescent stems are covered with a thinner tomentum that is more grayish than the grayish-brown color seen in *E. palmerianum* or the reddish-brown of *E. nidularium*. The involucres of var. *divaricatum* are turbinate and not campanulate as in *E. palmerianum*, and the involucres are restricted to well-defined nodes. Also, the branching pattern of the variety is similar to the open, spreading and generally up-right pattern of *E. baileyi* and thus with straight branch segments instead of the random, curving branch pattern of *E. palmerianum*.

Eriogonum densum is more closely related to *E. polycladon* Benth. in DC. than to either *E. nidularium* or *E. palmerianum*. It is a low, dense plant with numerous stems and branches arising from the base of the plant, but unlike *E. nidularium*, the branches are very short and straight, and are much more slender. The flowers are white, with the outer tepals broadly fan-shaped and thus much broader than the tepals of the inner whorl. In this regard, the flower is more similar to that of *E. nidularium* than that of *E. palmerianum*. The leaves of this species differ from the other two in that they are elliptic to oblanceolate instead of rounded. The tomentum of *E. densum* is blackish-gray. The involucres of *E. densum* are turbinate and shorter than those of *E. palmerianum* which are campanulate.

The distribution of the four taxa discussed here is fairly distinct, with overlap minimal in all states but Nevada. I have seen no hybrid populations in the field, but must admit that some herbarium material of *Eriogonum nidularium* and *E. palmerianum* is difficult to distinguish. I have had no difficulty in recognizing *E. baileyi* var. *divaricatum* or *E. densum*.

Eriogonum nidularium occurs from eastern Oregon and southwestern Idaho southward through eastern California and the western half of Nevada to about Inyo Co., California, where the species becomes much more abundant, and then ranges southward in California to Riverside Co., and eastward across Clark, Nye and Lincoln cos., Nevada, to Washington Co., Utah, and western Mohave Co., Arizona.

Eriogonum palmerianum ranges in California from Riverside Co. northward to Mono Co., and then drifts into Nevada where it is found from Esmeralda Co. northward through Churchill Co. to Humboldt Co., and then eastward (and much more abundant) across Nye, Clark and Lincoln cos., Nevada, to the western tier of counties in Utah (from Box Elder Co. south to Washington Co.), and across southern Utah to extreme southwestern Colorado. In Arizona, the

species occurs in Mohave and Coconino cos., southward to Yavapai and Gila cos., and then becomes gradually less common as one proceeds across Maricopa, Pima, Pinal, and Graham cos., into Cochise Co. My New Mexico records are restricted to Grant and Hidalgo cos. The degree of overlap between this species and *E. nidularium* is not great in Arizona and New Mexico (only Mohave Co.), but it is much more extensive in southern Nevada and adjacent southeastern California.

Eriogonum baileyi var. *divaricatum* is restricted to a small area in east-central California and adjacent west-central Nevada. My records show the variant to be rare from Lassen Co. southward to northern Inyo Co. in California, but more common in Washoe, Storey, Ormsby, Douglas and Humboldt cos., Nevada. It is to be excepted in Churchill, Lyon, and Pershing cos. as well. I have collected all three taxa that occur in this part of Nevada on several occasions, and no hybrids or confusing populations have been discovered.

Eriogonum densum, the real troublemaker in this complex, is known to me only from the type and one other collection, both from the Silver City area of Grant Co., New Mexico. The last collection of this taxon was made in 1903. To my knowledge, this species is restricted to the mountains in the Silver City area, and is not found outside New Mexico's Grant Co.

The distinction of the three species, *Eriogonum nidularium*, *E. palmerianum*, and *E. densum* is not difficult if one ignores the several errors made by past authors, and reviews the types of the taxa involved. The type of the first was collected in Inyo Co., California, while that of the second (*E. plumatella* var. *palmeri*) was gathered somewhere in Arizona. The type of the last, as already noted, was gathered near Silver City, New Mexico. Stokes (1936) simply did not understand these types to any great degree, and caused the difficulties now found in the literature. Hopefully now, the confusion can end.

61. *E. DENSUM* Greene. [*E. vimineum* Dougl. ex Benth. var. *d.* (Greene) S. Stokes.] Low spreading herbaceous annuals 0.5--1.5 dm high; leaves subbasal, elliptic to oblanceolate, 0.3--1 cm long, 2--7 mm wide, tomentose on both surfaces, usually somewhat less so above, the petiole 3--5 mm long; stems spreading, (1) 3--5 mm long, tomentose, numerous from the base; inflorescences dense, forming compact masses of numerous slender, floccose branches 0.5--1.2 dm long, the tips of the branches straight, not curved; involucre turbinate, 1--1.5 mm long, 0.7--1.2 mm wide, subglabrous without, scattered along the branches and appressed to them in the forks of the numerous nodes, the 5 acute teeth 0.4--0.6 mm long; flowers white, 1--1.5 mm long, glabrous, the tepals dimorphic, those of the outer whorl broadly fan-shaped, those of the inner whorl narrower and just slightly longer; achenes brown, 1--1.2 mm long. -- Rare and perhaps extinct, known only from Grant Co., N.M., in the Silver City area. Jun-Oct.

Little needs to be added to the discussion that has already

been presented under *Eriogonum palmerianum*. I have regarded this species as "endangered" and have so informed the Fish and Wildlife Service's Office of Endangered Species. Besides the type, the other collection that has been available to me is Metcalfe 840.

62. *E. POLYCLADON* Benth. in DC. [*E. p.* var. *mexicanum* Gandoger. *E. p.* var. *crispum* Gandoger. *E. vimineum* Dougl. ex Benth. ssp. *p.* (Benth. in DC.) S. Stokes.] Erect herbaceous annuals 1--6 (10) dm high; leaves cauline, narrowly oblanceolate to broadly elliptic, 1--3 cm long, 0.5--2 cm wide, densely tomentose below, only slightly less so above, the petiole 3--15 mm long; stems erect, slender, 1--3 dm long, tomentose; inflorescences narrow, strict, 1--5 (8) dm long, tomentose throughout; involucre turbinate, 1.5--2.5 mm long, 1--1.5 mm wide, tomentose to glabrous without, scattered along the branches and closely appressed, the 5 acute teeth 0.2--0.5 mm long; flowers white to pink, 1.5--2 mm long, glabrous, the tepals dimorphic, those of the outer whorl broadly fan-shaped and becoming strongly reflexed outwardly, those of the inner whorl narrower and remaining erect; achenes dark brown, 1--1.3 mm long. -- Rare to infrequent or rarely common and weedy from s. Utah s. into Ariz. and N.M. s. into w. Tex. and n. Mex.; Mohave and Coconino cos. se. through Yavapai Co. to Graham, Greenlee, and Santa Cruz and Cochise cos., Ariz., and in N.M. from Sandoval and Santa Fe cos. s. Jul-Oct (Dec).

This is a common species in widely scattered areas especially in the northern part of its range. It is much more common in the southern half of Arizona and New Mexico than in the northern half.

63. *E. DIVARICATUM* Hook. Low spreading herbaceous annuals 1--2 (3) dm high; leaves basal and cauline, the basal leaf-blades elliptic-oblong to orbicular, 1--3 cm long, 1--2 cm wide, puberulent to short pilose on both surfaces, the petiole 2--4 cm long, the cauline leaf-blades similar but becoming gradually reduced in size above; stems spreading to decumbent or prostrate, 3--5 cm long, puberulent, leafy; inflorescences spreading, often decumbent and spreading along the ground, 0.5--2.5 dm long, puberulent; involucre turbinate, 1--2 mm long, 0.7--1.2 mm wide, pilose, the 5 lanceolate lobes 0.7--1.8 mm long, dividing the tube nearly to the base; flowers yellowish, 1.5--2 mm long, hispidulous or glandular without, the tepals mostly oblong, those of the inner whorl just slightly narrower; achenes light brown, 1.5--1.8 mm long. -- In widely scattered locations on clay hills and slopes from e. Utah and sw. Wyo. s. through w. Colo. to nw. N.M. and n. Ariz.; Coconino, Navajo, and Apache cos., Ariz., and San Juan, Sandoval, and McKinley cos., N.M. Jun-Sep (Oct).

64. *E. PUBERULUM* S. Wats. [*E. p.* var. *venosum* S. Stokes.] Low spreading herbaceous annuals 0.5--3 dm high; leaves basal, obovate to rounded, 0.5--1.5 cm long and wide, sparsely villous on both surfaces, the petiole 0.5--2 cm long; stems erect or spreading, 3--8 cm long, silky-puberulent; inflorescences spreading,

0.5--2.5 dm long, silky-puberulent, often with highly reduced, bractlike leaves at the lower nodes; involucre turbinate, 1--1.5 mm long, 0.6--1 mm wide, villous without, the 4 oblong lobes dividing the tube nearly to the base; flowers white to red, 1--1.5 mm long, glabrous or hispidulous without, the tepals slightly dimorphic, those of the outer whorl obcordate, those of the inner whorl narrower; achenes light brown, 1 mm long. -- Infrequent and widely scattered in sw. Utah and se. Nev.; not known from Ariz. but to be expected in extreme ne. Mohave or nw. Coconino cos. Jun-Aug.

Kearney and Peebles (1951) felt that this species should be found eventually in Arizona, and I can see no immediate reason why it should not be found there. As yet, however, no specimens have been seen from Arizona.

65. *E. DARROVII* Kearney. Low spreading herbaceous annuals 0.3--1.5 dm high; leaves basal and cauline, the basal leaf-blades obtuse, 0.6--1.2 (1.5) cm long, 0.5--1 (1.3) cm wide, sericeous and green on both surfaces, the petiole 0.5--1.5 cm long, the cauline leaf-blades similar to the basal leaves only becoming gradually reduced in size upwardly; stems spreading to weakly erect, 3--5 cm long, sericeous and green throughout; inflorescences dense and compact with numerous sericeous branches 0.3--1.2 dm long; involucre turbinate-campanulate, 2--2.5 mm long, 1.5--2 mm wide, sericeous without, the elliptic lobes 1--1.3 mm long, 0.4--0.6 mm wide, sericeous; flowers pale yellow to pinkish, 1.5--2 mm long, white-hirtellous, the tepals strongly dimorphic, those of the outer whorl fan-shaped and hooded, those of the inner whorl lanceolate and erect, usually longer than the tepals of the outer whorl; achenes brown, 1 mm long. -- Local and usually rare in Coconino Co., Ariz., and White Pine Co., Nev. Jul-Sep.

This rare species was first collected south of Major's Place along U. S. Highway 93 by Ripley and Barneby (6316 - CAS), but the plants were so immature, that they were not recognized as a unique species, and in fact were reported by Barneby (1947) as *Eriogonum divaricatum*. The type of *E. darrovii* was collected in 1945 and described by Kearney (1946) a year later. More recently, the species has been collected near Slide Tank, and Dr. N. Duane Atwood of the Bureau of Land Management in Utah, has recollected this species in Coconino Co. where it is restricted to the northern edge of the Kaibab Plateau. I have regarded this species as "endangered" as the Nevada population is restricted to a single limestone outcrop, and the Arizona populations, according to Atwood, are subject to disruption by logging, road building, and grazing pressures on the Kaibab Plateau.

EXCLUDED SPECIES

Eriogonum flexum M. E. Jones = *Stenogonum flexum* (M. E. Jones) Reveal & Howell. In a recent review of the genera of the subfamily Eriogonoideae, Reveal and Howell (1976) have excluded

this species from *Eriogonum* and placed it in the genus *Stenogonum*. *Stenogonum* will be discussed in a forthcoming paper by Reveal and Ertter (in press).

Eriogonum nemacaulis S. Stokes = *Nemacaulis denudata* Nutt.

Eriogonum perfoliatum (Torr. & Gray) S. Stokes = *Oxytheca perfoliata* Torr. & Gray.

Eriogonum salsuginosum (Nutt.) Hook. = *Stenogonum salsuginosum* Nutt.

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The following list of names is supplied to all entities mentioned in this treatment. Names in bold face are acceptable names and the number is the number of the species in this treatment at which the taxon is formally treated; those in *italics* are synonyms or the number of the taxon (taxa) where a particular named is discussed but not otherwise treated. New taxa are indicated in CAPITAL LETTERS.

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LITERATURE CITED

- ANDERSON, J. M. 1959. A revision of *Eriogonum* section *Pedunculata*. Unpublished doctoral dissertation, University of Oklahoma Library, Norman.
- BARNEBY, R. C. 1947. Distributional notes and minor novelties. *Leafl. W. Bot.* 5: 61--66.
- FOSBERG, F. R. 1938. *Eriogonum abertianum* and its varieties. *Madroño* 4: 189--194.
- GANDOGGER, M. 1906. Le genere *Eriogonum* (Polygonaceae). *Bull. Soc. Roy. Bot. Belgique* 42: 183--200.
- HESS, W. J., and J. L. REVEAL. In press. A revision of *Eriogonum* (Polygonaceae) subgenus *Pterogonum*. *Great Basin Naturalist*.
- HIGGINS, L. C. 1967. A flora of the Beaver Dam Mountains. Unpublished Master's Thesis, Brigham Young University Library, Provo, Utah.
- HOWELL, J. T. 1943. *Plantae occidentales* - III. *Leafl. W. Bot.* 3: 205--208.
- HOWELL, J. T. 1944. A new fruticulose *Eriogonum*. *Leafl. W. Bot.* 4: 5--7.
- HOWELL, J. T. 1973. Where does Torrey's buckwheat grow? *Calif. Native Pl. Soc. Newslett.* 8(4): 23.
- HOWELL, J. T. 1976. *Eriogonum* notes VII. *Mentzelia* 1: 17--22.
- JEPSON, W. L. 1913. A flora of California. 1: 376--428.
- JOHNSTON, I. M. 1944. Plants of Coahuila, eastern Chihuahua and adjoining Zacatecas and Durango, V. *J. Arnold Arb.* 25: 133--182.
- KEARNEY, T. H. 1946. A new *Eriogonum* from Arizona. *Leafl. W. Bot.* 4: 267--268.
- KEARNEY, T. H., and R. G. PEEBLES. 1951. *Arizona Flora*. University of California Press, Berkeley.
- KEARNEY, T. H., and R. G. PEEBLES. 1969. *Arizona Flora*. Second edition with supplement by John Thomas Howell, Elizabeth McClintock and collaborators. University of California Press, Berkeley.
- MCDUGALL, W. B. 1973. Seed plants of Northern Arizona. Museum

of Northern Arizona, Flagstaff.

- MUNZ, P. A., and D. D. KECK. 1959. A California flora. University of California Press, Berkeley.
- NELSON, R. A. 1976. Plants of Zion National Park. Zion Natural History Association, Springdale, Utah.
- REVEAL, J. L. 1966. Notes on three Utah eriogonums. Proc. Utah Acad. Sci. 42: 287--292.
- REVEAL, J. L. 1968a. Notes on Eriogonum - IV. A revision of the Eriogonum deflexum complex. Brittonia 20: 13--33.
- REVEAL, J. L. 1968b. Notes on Eriogonum - V. A revision of the Eriogonum corymbosum complex. Great Basin Naturalist 27: 183--229.
- REVEAL, J. L. 1968c. Notes on the Texas eriogonums. Sida 3: 195--205.
- REVEAL, J. L. 1968d. Eriogonum umbellatum var. cognatum (Greene) Reveal. Southw. Naturalist 13: 357--359.
- REVEAL, J. L. 1968e. On the status of Eriogonum jonesii S. Wats. (Polygonaceae). Southw. Naturalist 13: 359--361.
- REVEAL, J. L. 1969. A new perennial buckwheat (Eriogonum, Polygonaceae) from southeastern Arizona. J. Ariz. Acad. Sci. 5: 222--225.
- REVEAL, J. L. 1970. "Eriogonum." In: D. S. Correll and M. C. Johnston, Manual of the vascular plants of Texas, pp. 510--516. Texas Research Foundation, Renner.
- REVEAL, J. L. 1971. Notes on Eriogonum - VI. A revision of the Eriogonum microthecum complex (Polygonaceae). Brigham Young Univ. Sci. Bull., Biol. Ser. 13(1): 1--45.
- REVEAL, J. L. 1973. Eriogonum (Polygonaceae) of Utah. Phytologia 25: 169--217.
- REVEAL, J. L. 1974a. Two shrubby novelties in Eriogonum (Polygonaceae) from the deserts of Utah and Arizona. Brittonia 26: 90--94.
- REVEAL, J. L. 1974b. Two new varieties of Eriogonum (Polygonaceae) from the intermountain region. Great Basin Naturalist 34: 245--246.
- REVEAL, J. L., and B. J. ERTTER. In press. A re-establishment of

the genus *Stenogonum* (Polygonaceae). Great Basin Naturalist.

- REVEAL, J. L., and J. HENRICKSON. 1975. A new variety of *Eriogonum ericifolium* (Polygonaceae). *Madroño* 23: 205--209.
- REVEAL, J. L., and J. T. HOWELL. 1976. *Dedeckera* (Polygonaceae), a new genus from California. *Brittonia* 28: 245--251.
- REVEAL, J. L., and P. A. MUNZ. 1968. "Eriogonum." In: P. A. Munz, A supplement to A California Flora, pp. 33--72. University of California Press, Berkeley.
- RYDBERG, P. A. 1921. Two new species from Arizona. *Amer. Bot.* 27: 61--63.
- SHREVE, F., and I. L. WIGGINS. 1964. Vegetation and flora of the Sonoran desert. Stanford University Press, Stanford, California.
- SMALL, J. K. 1898. Studies in North American Polygonaceae. I. *Bull. Torrey Bot. Club* 25: 40--53.
- STOKES, S. G. 1936. The genus *Eriogonum*, a preliminary study based on geographical distribution. J. H. Neblett Press, San Francisco.
- WATSON, S. 1886. Contributions to American botany. *Proc. Amer. Acad. Arts* 21: 414--468.
- WEBER, W. A. 1972. Rocky Mountain flora. Colorado Associated University Press, Boulder.
- WELSH, S. L., N. D. ATWOOD, and J. L. REVEAL. 1976. Endangered, threatened, extinct, endemic and rare or restricted Utah vascular plants. *Great Basin Naturalist* 35: 327--376.
- WOOTON, E., and P. C. STANDLEY. 1913. Descriptions of new plants preliminary to a report upon the flora of New Mexico. *Contr. U. S. Natl. Herb.* 16: 109--196.